Report

..Production Technology..

The different casting processes

The different welding methods

The different lathing processes

By

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Introduction:

I have prepared this report describing the different casting processes with an example of each. And also to describe the different welding methods and the different lathing processes.

1-Different casting-forming processes description and example for each:

Casting is a manufacturing process in which a liquid material is usually poured into a mold, which contains a hollow cavity of the desired shape, and then allowed to solidify. The solidified part is also known as a casting, which is ejected or broken out of the mold to complete the process. Casting materials are usually metals or various time setting materials that cure after mixing two or more components together; examples are epoxy, concrete, plaster and clay.

There are three main types of casting processes:

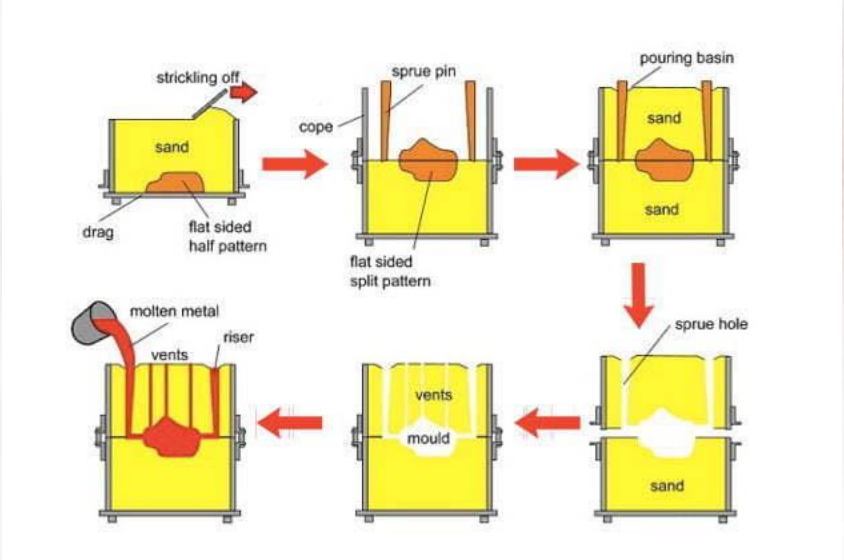
1- Expendable Mold Casting: In expendable mold casting, the mold is destroyed to remove the casting and a new mold is required for each new casting such as (Sand casting – investment casting – shell casting)

2- Permanent Mold Casting : In the permanent mold casting the mold open to remove the casting and again repeated the process, such as Hot chamber, Centrifugal Casting.

3- Continuous casting: It is the most efficient way to produce a large amount of alloys and the production is continuous. It provides fast production and the best quality.

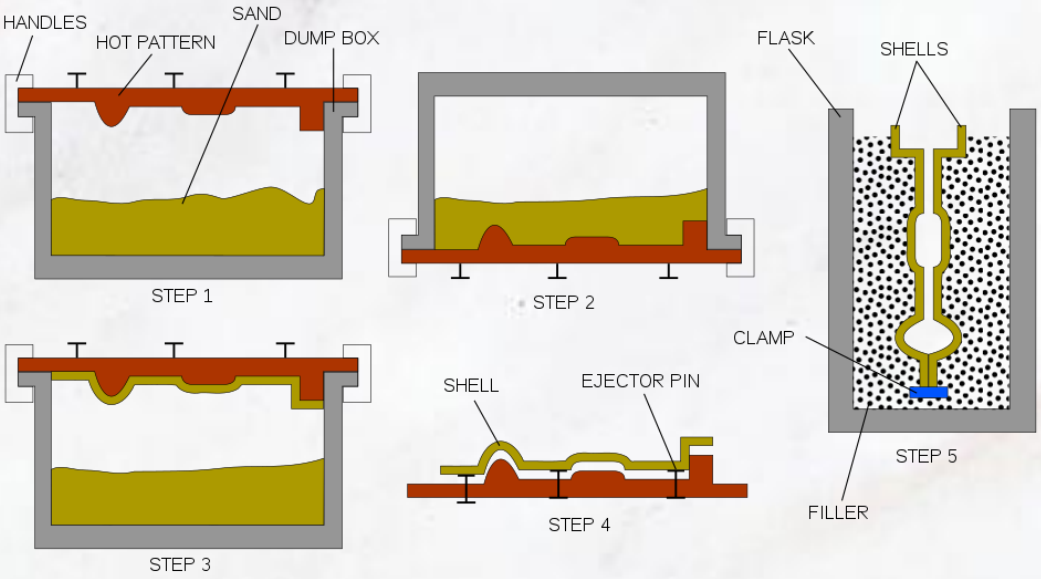
- **Sand casting**

The most widely used casting process, utilizes expendable sand molds to form complex metal parts that can be made of nearly any alloy. Because the sand mold must be destroyed in order to remove the part, called the casting, sand casting typically has a low production rate. The sand casting process involves the use of a furnace, metal, pattern, and sand mold. The metal is melted in the furnace and then ladled and poured into the cavity of the sand mold, which is formed by the pattern. The sand mold separates along a parting line and the solidified casting can be removed. For example, it is used in the manufacture of engine blocks, cylinder heads.



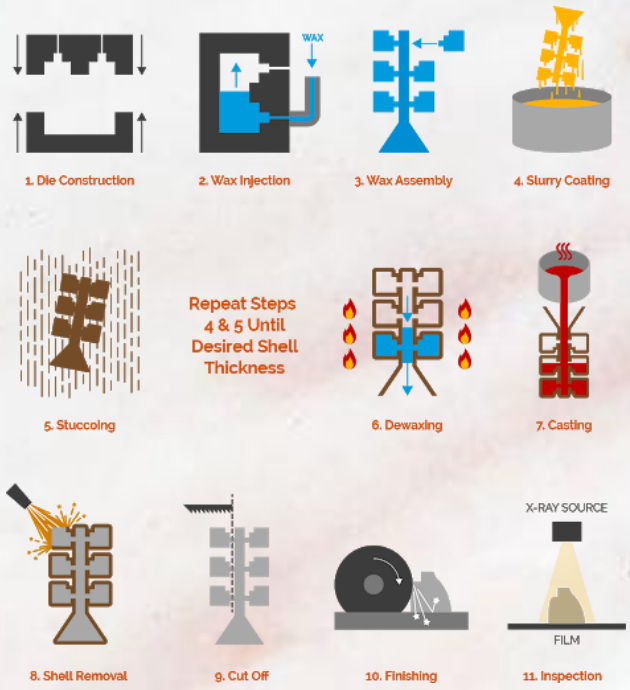
- **Shell Molding Casting**

It is a recent invention in casting techniques for mass production and smooth surface finishing. They are consumable molds that use resin coated sand to form the mold. This process compared to sand casting has better dimensional accuracy, higher production rate, and fewer work requirements. For example, it is used in the manufacture of connecting rods, gear housings.



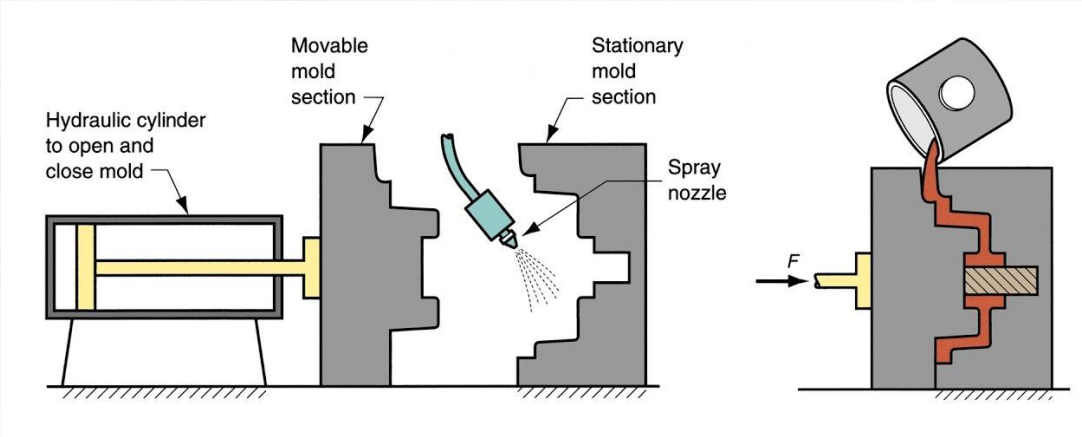
- **Investment Casting (lost wax casting)**

Is a mechanized, industrialized process that is capable of producing precise, accurate units with tight tolerances, thinner walls, and smooth surface finishes. During the investment casting process, a wax pattern is created and dipped in liquid ceramic, delivering superior dimensionality with minimal machining after the ceramic shell is broken off. Although lost wax casting is a fairly precise and accurate procedure, it's history includes molds with beeswax and clay, making it ideal for art-related projects like jewelry and ornamental work.



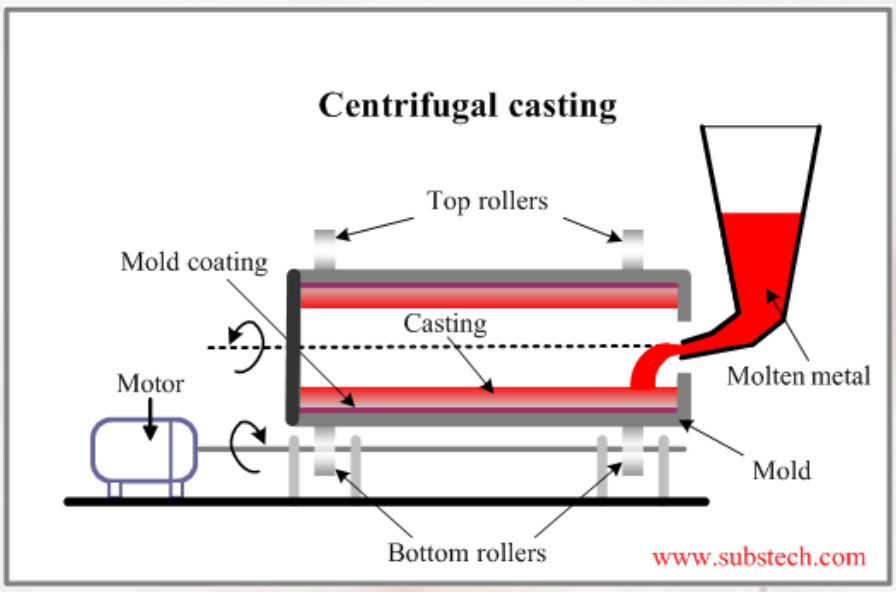
- **Permanent Mold Casting Processes**

It is a process during which a large number of castings are produced using the same mold, meaning that the mold is permanent. In this process, the mold is heated and coated with a lubricant to facilitate the molding separation. Then the molten metal is poured into the mold and left to cool. Finally, open the mold to remove the final product. For example, it is used in the manufacture of gears, gear housings



- **Centrifugal Casting**

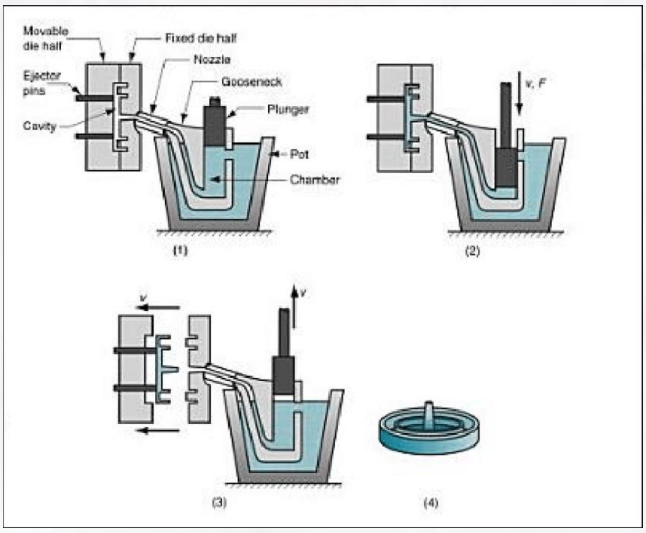
In centrifugal casting process, molten metal is poured into a revolving mold and allowed to solidify molten metal by pressure of centrifugal force. It is employed for mass production of circular casting as the castings produced by this process are free from impurities. It is typically used to cast materials such as metals, glass, and concrete. A high quality is attainable by control of metallurgy and crystal structure. For example, it is used in the manufacture of pipes, boilers, flywheels.



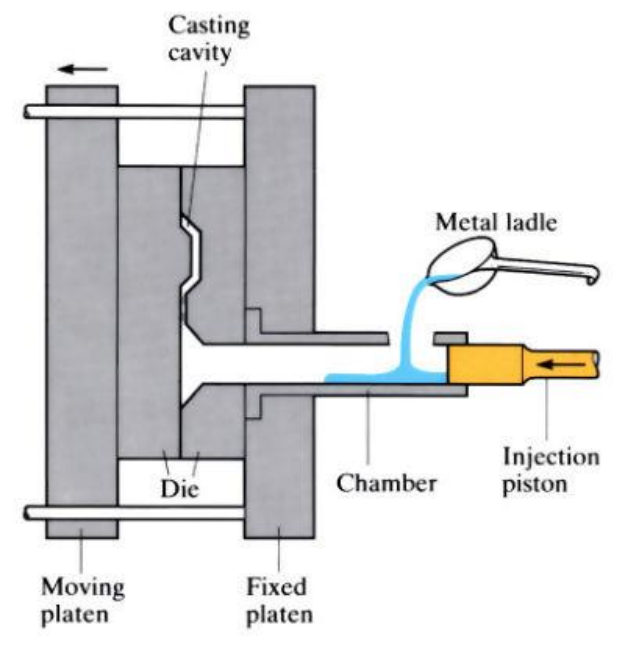
- **Die-casting**

The mold consists of two halves that are held together tightly and then the molten metal is injected into the cavity of the mold, where it hardens quickly. Then the two halves of the mold are separated from each other and the molding is taken out. It is the fastest process to produce fine non-ferrous metal parts. For example, it is used in the manufacture of gears, camera bodies, car wheels. It has two types: hot chamber die-casting and cold chamber die-casting, one of these two types is used depending on the type of cast metal as follows:

1- hot chamber die-casting: are primarily used with zinc-, tin-, and lead-based alloys.



2- cold chamber die-casting: these include aluminium, zinc alloys with a large composition of aluminium, magnesium and copper.



2-Different methods of welding and different turning processes:

Welding Process:

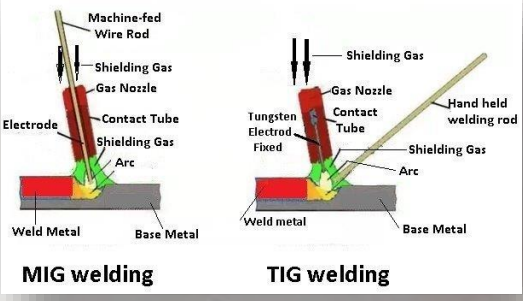
Welding is a fabrication process whereby two or more parts are fused together by means of heat, pressure or both forming a join as the parts cool. Welding is usually used on metals and thermoplastics but can also be used on wood. The completed welded joint may be referred to as a weldment.

1- Gas Welding Processes:

It is the process of fusion welding that binds metals, using the heat of combustion of a mixture of oxygen in the air and fuel gas. The parts to be welded will melt and fuse together due to the intense heat of the flame. One of the most popular types of gas welding is (Oxygen-Acetine Welding).

2- Arc Welding Processes:

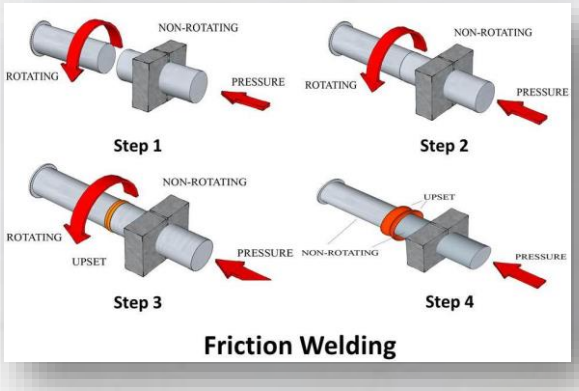
It is the process of welding by using electricity to generate sufficient heat to melt the metal. In this welding, the welding power source is used to create an electric arc between the electrode and the base material to melt the metal at the point of contact. Among the most popular types of arc welding are (Gas metal arc welding- MIG) & (Gas tungsten arc welding- TIG).



In the TIG, non-consumable tungsten is used for the discharging electrode and an inert gas such as argon or helium is used as the shielding gas. In the MIG, as with TIG welding, an inert gas is used for the shielding gas, but MIG welding is a consumable electrode type of welding that uses a discharge electrode that melts during welding. The process is generally used for joining stainless steel or aluminum alloy workpieces.

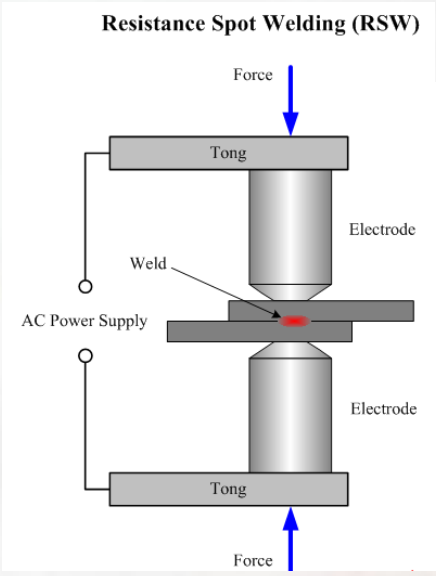
3- Friction Welding Process:

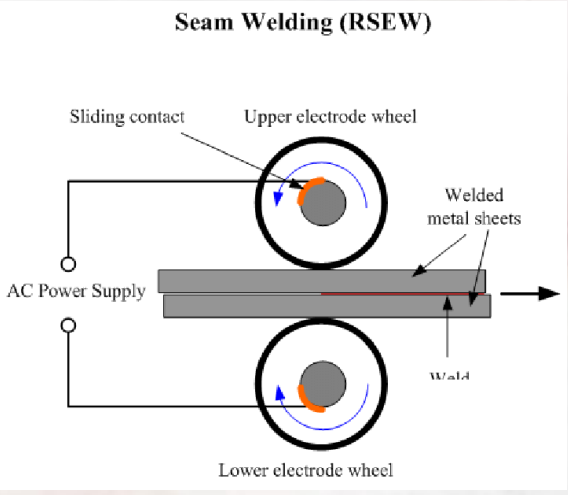
It is one of the most popular types of solid state welding. Fusion between two pieces occurs due to the high temperature during the mechanical friction process between a moving work piece and a fixed component.



4- Resistance Welding:

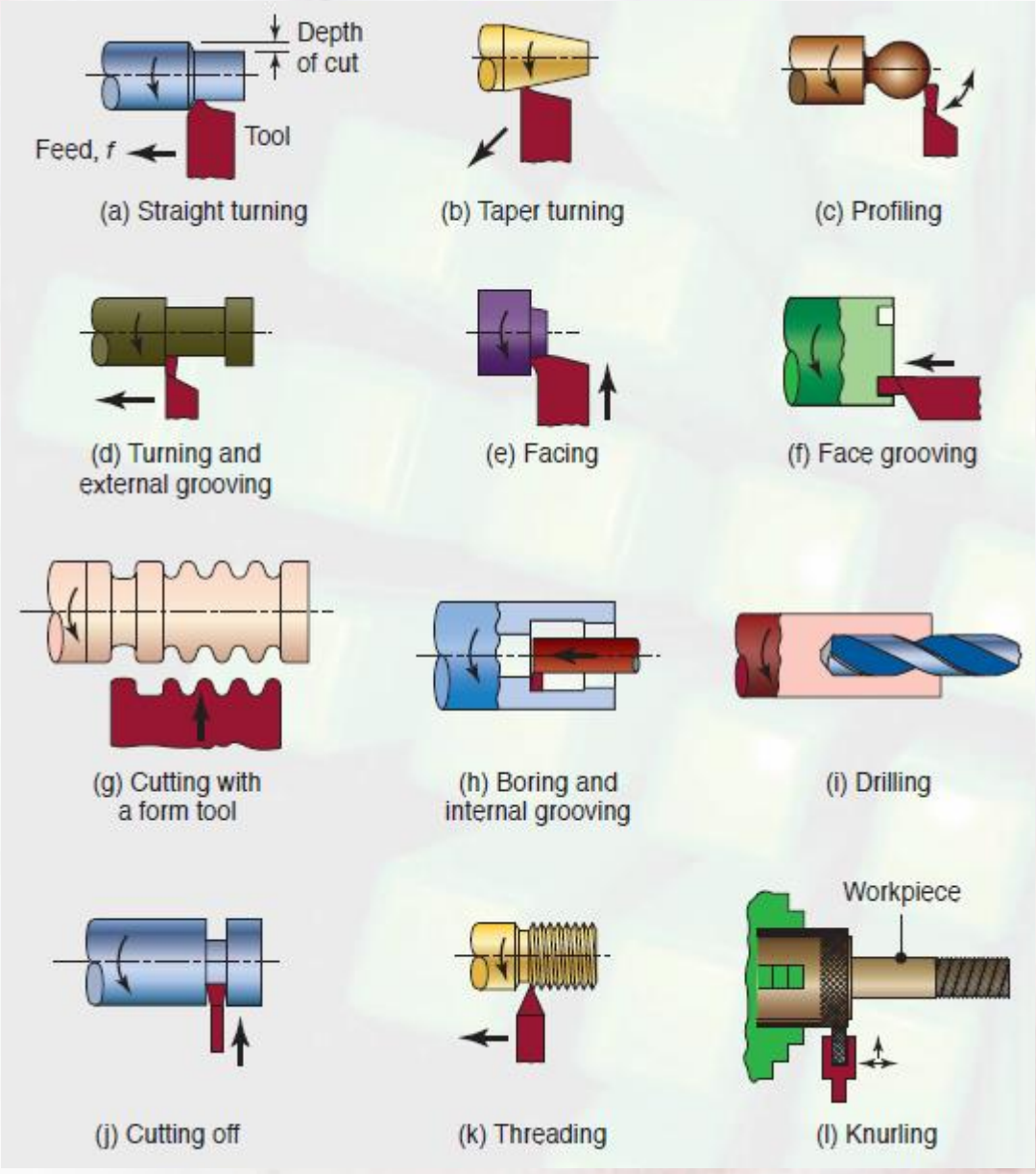
It is a process by which metals can be joined together by applying pressure and conducting a strong electric current through the metal combination to heat up the welding joint and melt the metals, forging them together. (Spot welding) and (Seam welding) are the most popular types of resistance welding.





❁ Turning Machine (Lathe):

Lathe is one of the most versatile and widely used machine tools all over the world. It is commonly known as the mother of all other machine tool. The main function of a lathe is to remove metal from a job to give it the required shape and size. Turning has several different operations, which are as follows:



Conclusion:

In conclusion, after completing this report, in which I explained the different casting processes in detail with an example of each, and after explaining the different welding methods and the most famous types, and the different lathing processes with pictures for clarity. We find the importance of casting processes in the manufacture of some products, tools and spare parts. Also, the welding process is important in gluing two pieces together. I hope that I have explained everything that is required of me to the fullest.