1. CASTING:

The casting process is the manufacturing process in which molten material such as metal is poured into a casting cavity or mold of the desired shape and allowed to harden or solidify within the mold; after solidification, the casting is removed by ejecting or breaking the mold.

STEPS INVOLVED IN CASTING :

1. Preparation of Pattern and Mould:

A pattern is a replica of the part to be cast and is used to prepare the mould cavity. A mould is an assembly of two or more metal blocks or bonded refractory particles (sand) consisting of a primary cavity that holds the liquid material and acts as a negative of the desired product. Secondary cavities are also present to pour and channel the liquid material into the primary cavity.

2. Melting and Pouring of the Liquefied Metal:

Proper attention during melting is required for a good, defect-free casting. Gases in metals, scrap selection and control, flux, furnace, and temperature are all important considerations during melting.

After melting, the metal is poured or injected into the mold cavity. A good gating design ensures that the metal is distributed properly in the mould cavity without causing excessive temperature loss, turbulence, or entrapment of gasses and slag.

3. Cooling and Solidification of Liquid Metal:

During solidification, numerous critical features such as crystal structure and alloy composition at various regions of the casting are determined. Furthermore, unless sufficient care is taken, various flaws such as shrinkage cavity, cold closure, misrun, and hot tear might arise.

4. Defects and its Inspection:

Casting is an important manufacturing technique, but it frequently contains flaws that jeopardize the end product's quality and performance. These errors occur as a result of poor process control, material problems, or design deficiencies. The most common casting faults include shrinkage, porosity, misruns, cold shuts, inclusions, and fractures. Shrinkage faults form when the metal shrinks during solidification, resulting in cavities and weak places in the casting. This is frequently caused by insufficient feeding of molten metal, poor riser design, or quick cooling.

1)Porosity

Causes : include gas entrapment, incorrect venting, and excess moisture in the mold.

Prevention: Use dry materials, correct degassing procedures, and vacuum casting.

Inspection methods include X-ray and ultrasonic testing, as well as pressure testing.

2)Shrinkage Defects

Causes: Insufficient material to account for contraction during solidification.

Prevention measures include proper gating and riser construction, as well as the use of chillers for direct cooling.

examination methods include visual examination, radiographic testing, and ultrasonic testing.

3)Cold shutdown

Causes include low pouring temperatures, an inefficient gating system, and delayed filling.

Preventive measures include increasing the pouring temperature, improving fluidity, and optimizing mold design.

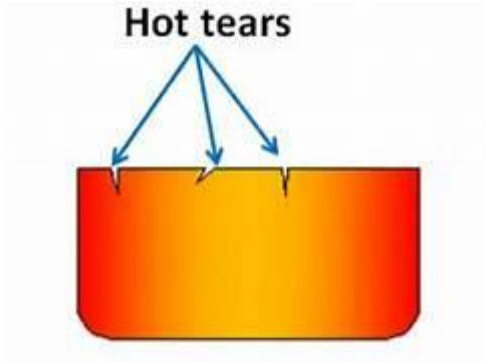
Inspection methods include visual inspection and liquid penetrant testing.

4)Hot Tears

Causes include high residual stresses, inadequate mold design, and restricted shrinkage.

Prevention measures include using flexible molds, using the right alloy composition, and cooling under regulated conditions.

Inspection methods include visual inspection and dye penetrant testing.



5)Misruns

Causes include low fluidity of molten metal and early solidification.

Preventive measures include raising the pouring temperature and improving the mold design.

Inspection: Visual inspection

6)Metal Penetration:

Causes include poor mold permeability and high pouring temperatures.

Prevention: Use finer sand grains, add mold coatings, and adjust metal temperature.

Inspection includes visual and dimensional measurements.

7) Inclusions

Causes include foreign particles, slag, and oxide production.

Prevention includes proper filtration and slag removal techniques.

Inspection includes X-ray and ultrasonic testing.