

Metal Casting Process

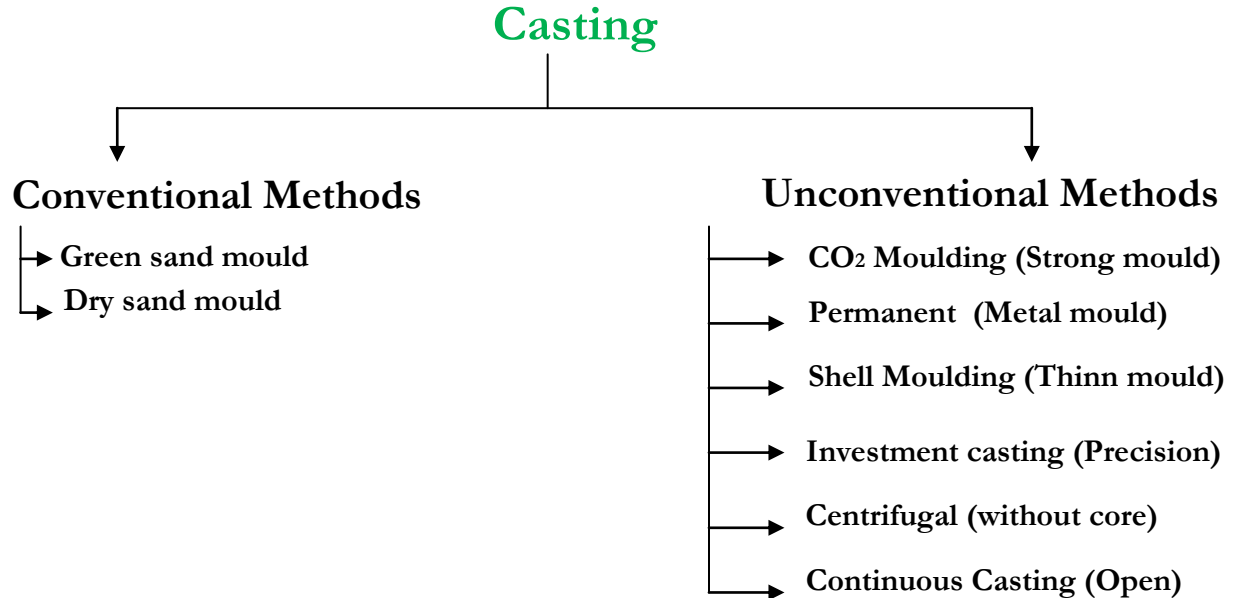
Manufacturing

- Manufacturing in its broadest sense is the process of converting raw materials into useful products.
- It includes
 - i) Design of the product
 - ii) Selection of raw materials and
 - iii) The sequence of processes through which the product will be manufactured.

Casting

Casting is the process of producing metal parts by pouring molten metal into the mould cavity of the required shape and allowing the metal to solidify. The solidified metal piece is called as “casting”.

Types of casting



Advantages

- Design flexibility
- Reduced costs
- Dimensional accuracy
- Versatility in production

Disadvantages

- Lot of molten metal is wasted in riser & gating
- Casting may require machining to remove rough surfaces

Sand Casting

Sand Casting is simply melting the metal and pouring it into a preformed cavity, called mold, allowing (the metal to solidify and then breaking up the mold to remove casting. In sand casting expandable molds are used. So for each casting operation you have to form a new mold.

- Most widely used casting process.
- Parts ranging in size from small to very large
- Production quantities from one to millions
- Sand mold is used.
- Patterns and Cores
 - Solid, Split, Match-plate and Cope-and-drag Patterns
 - Cores – achieve the internal surface of the part

Molds

- Sand with a mixture of water and bonding clay
- Typical mix: 90% sand, 3% water, and 7% clay
- to enhance strength and/or permeability

Sand – Refractory for high temperature

Size and shape of sand

Small grain size -> better surface finish

Large grain size -> to allow escape of gases during pouring

Irregular grain shapes -> strengthen molds due to interlocking but to reduce permeability

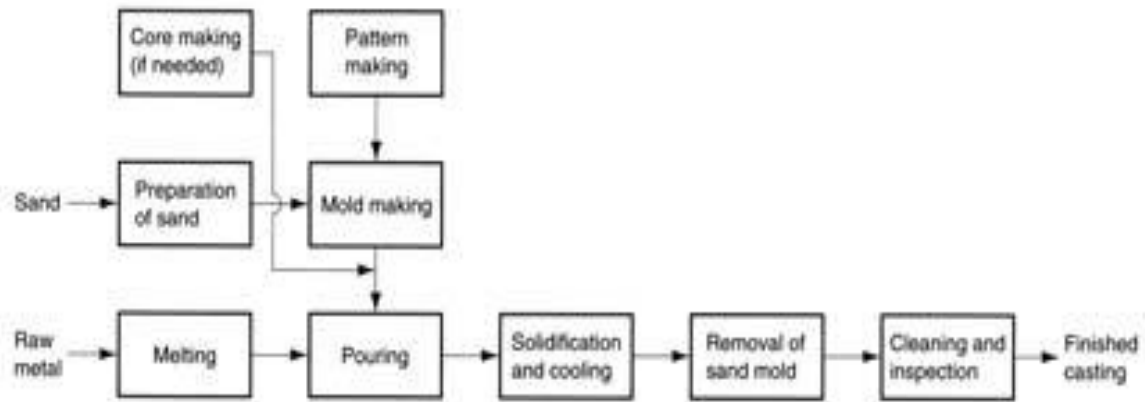
Types of sand

- a) Green-sand molds - mixture of sand, clay, and water; "Green" means mold contains moisture at time of pouring.
- b) Dry-sand mold - organic binders rather than clay and mold is baked to improve strength
- c) Skin-dried mold - drying mold cavity surface of a green-sand
 - mold to a depth of 10 to 25 mm, using torches or heating

Steps in Sand Casting

The cavity in the sand mold is formed by packing sand around a pattern, separating the mold into two halves

- The mold must also contain gating and riser system
 - For internal cavity, a core must be included in mold
 - A new sand mold must be made for each part
1. Pour molten metal into sand mold
 2. Allow metal to solidify
 3. Break up the mold to remove casting
 4. Clean and inspect casting
 5. Heat treatment of casting is sometimes required to improve metallurgical properties



Source : <http://nprcet.org/e%20content/mech/MT.pdf>