



SNS College of Technology

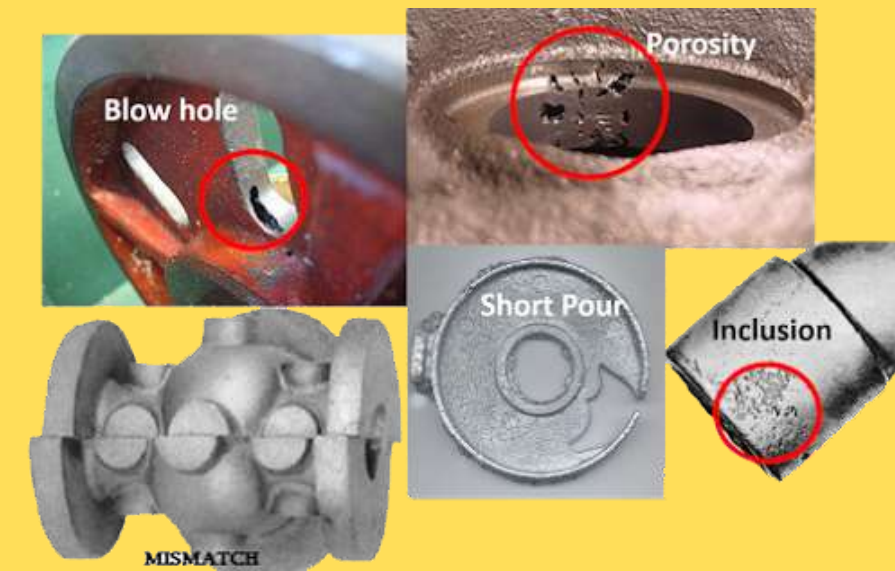
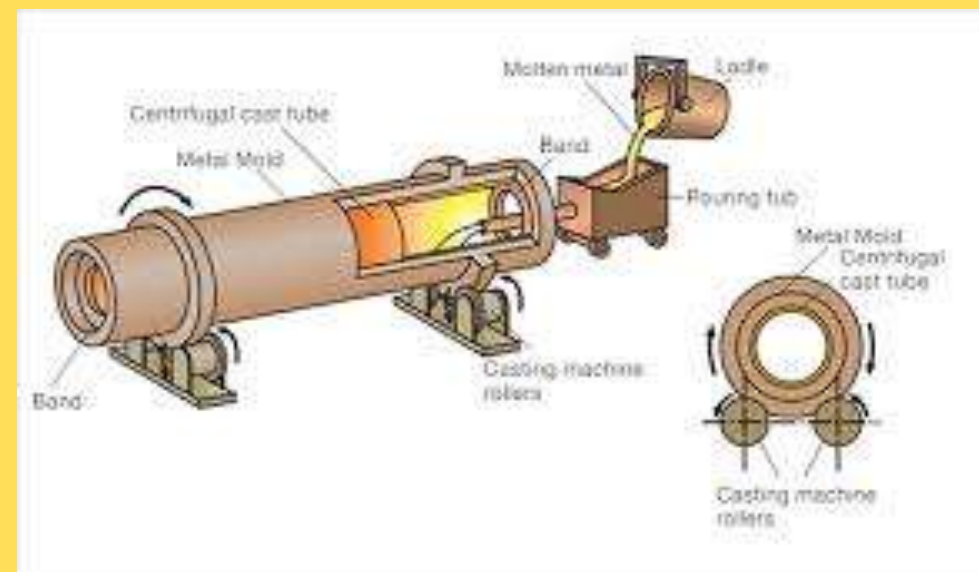
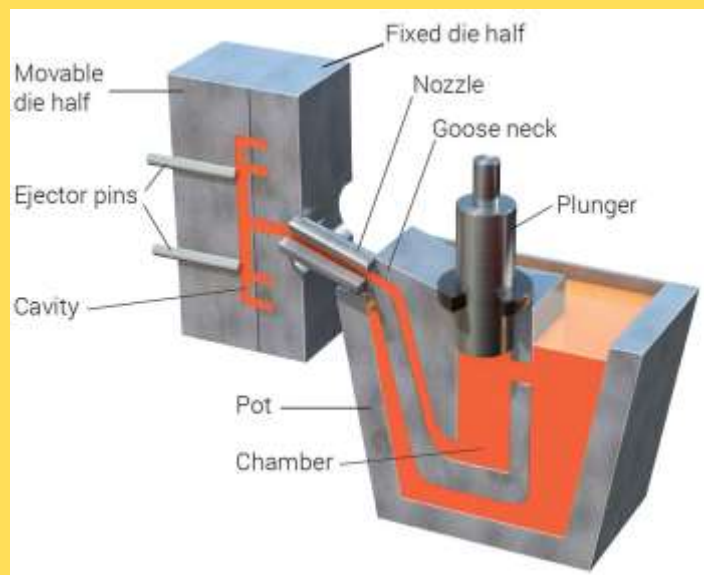
Department of Mechanical Engineering



MANUFACTURING TECHNOLOGY

Unit - I

Topic : Pressure die casting - Centrifugal Casting - Fettling



Source : <https://www.kubota.com>

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Pressure die casting

- The *pressure die casting process* is the most common for **Al, Zn** and **Mg** castings (low melting point).
- The liquid metal is injected into the mold under **high pressure** and allowed to solidify at the high pressure.
- The solidified cast is then taken out of the mold or the die which is ready for the next cast.
- Two types of pressure die casting are generally common in the industry – (a) **high pressure** die casting and (b) **low pressure** die casting.



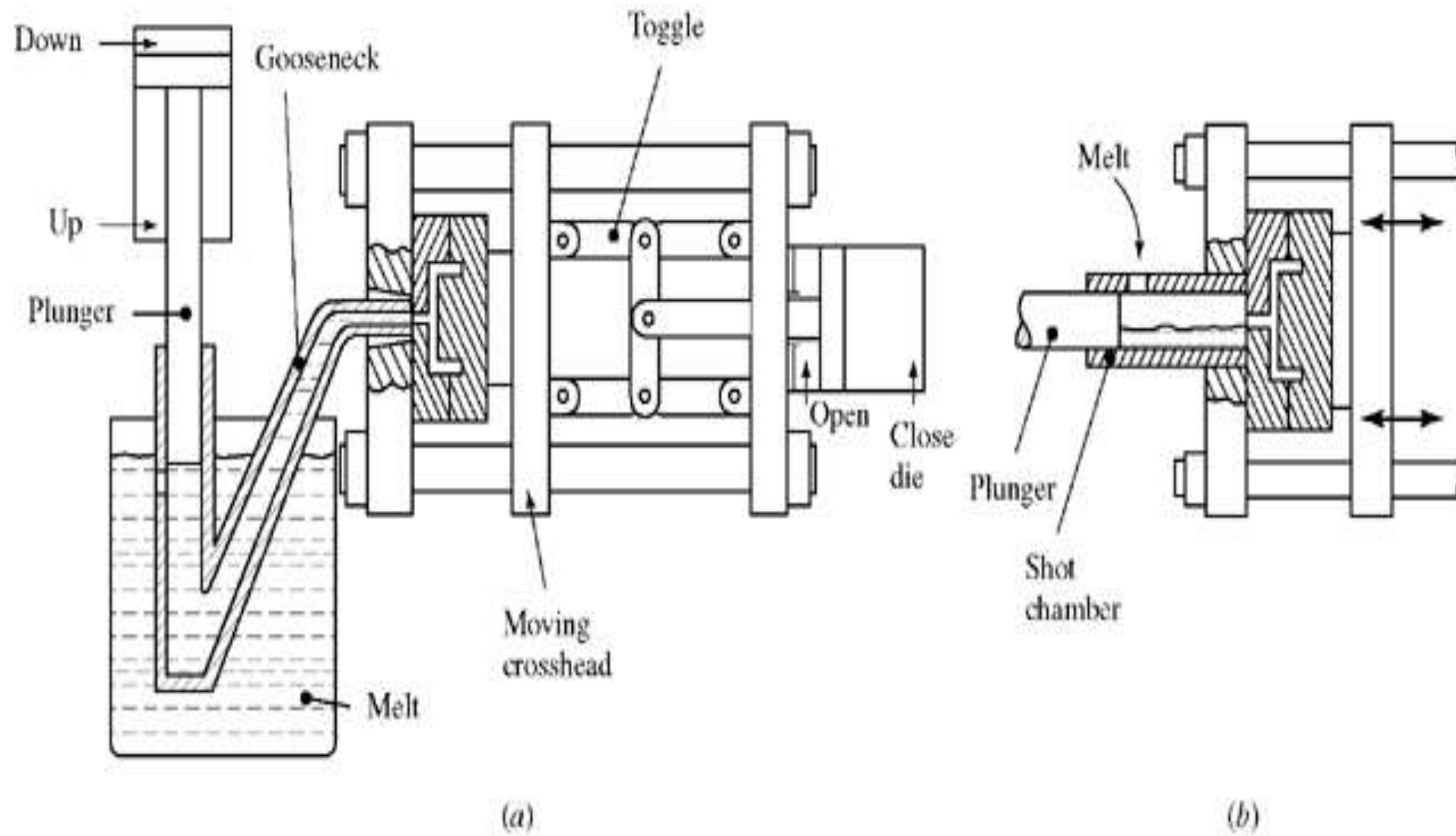
Pressure die casting

- However, the process is **not suitable** for casting of **high melting temperature materials** as the die material has to withstand the melting (or superheated) temperature of the casting.
- Pressure die castings also **contain porosity** due to the **entrapped air**. Furthermore, the dies in the pressure die casting process are usually very costly.
- In the hot-chamber die casting process, the furnace to melt material is part of the die itself and hence, this process is suitable **primarily for low-melting point temperature materials** such as aluminum, magnesium etc.



Pressure die casting

Set-up of (a) hot-chamber (b) cold-chamber die casting processes



Source : Researchgate.net



Pressure die casting

Hot-chamber die casting,

- Hot-chamber die casting, also known *gooseneck machines*, rely upon a pool of molten metal to feed the die. At the beginning of the cycle the piston of the machine is retracted, which allows the molten metal to fill the "gooseneck".
- The pneumatic- or hydraulic-powered piston then forces this metal out of the gooseneck into the die. The advantages of this system include fast cycle times (approximately 15 cycles a minute) and the convenience of melting the metal in the casting machine.
- The disadvantages of this system are that it is limited to use with low-melting point metals and that aluminium cannot be used because it picks up some of the iron while in the molten pool. Therefore, hot-chamber machines are primarily used with zinc-, tin-, and lead-based alloys



Pressure die casting

Cold Chamber Die Casting

- These are used when the casting alloy cannot be used in hot-chamber machines; these include aluminium, zinc alloys with a large composition of aluminium, magnesium and copper. The process for these machines start with melting the metal in a separate furnace.
- Then a precise amount of molten metal is transported to the cold-chamber machine where it is fed into an unheated shot chamber (or injection cylinder). This shot is then driven into the die by a hydraulic or mechanical piston.
- The biggest disadvantage of this system is the slower cycle time due to the need to transfer the molten metal from the furnace to the cold-chamber machine



Pressure die casting



Applications

1. Carburetor bodies
2. Hydraulic brake cylinders
3. Refrigeration castings
4. Washing machine
5. Connecting rods and automotive pistons
6. Oil pump bodies
7. Gears and gear covers
8. Aircraft and missile castings, and
9. Typewriter segments



Strong



Source : Precicraft.com



Centrifugal Casting



- In centrifugal casting process, the molten metal poured at the center of a rotating mold or die. Because of the centrifugal force, the lighter impurities are crowded towards the center of the case.
- For producing a hollow part, the axis of rotation is placed at the center of the desired casting. The speed of rotation is maintained high so as to produce a centripetal acceleration of the order of 60g to 75g.
- For producing a hollow part, the axis of rotation is placed at the center of the desired casting.



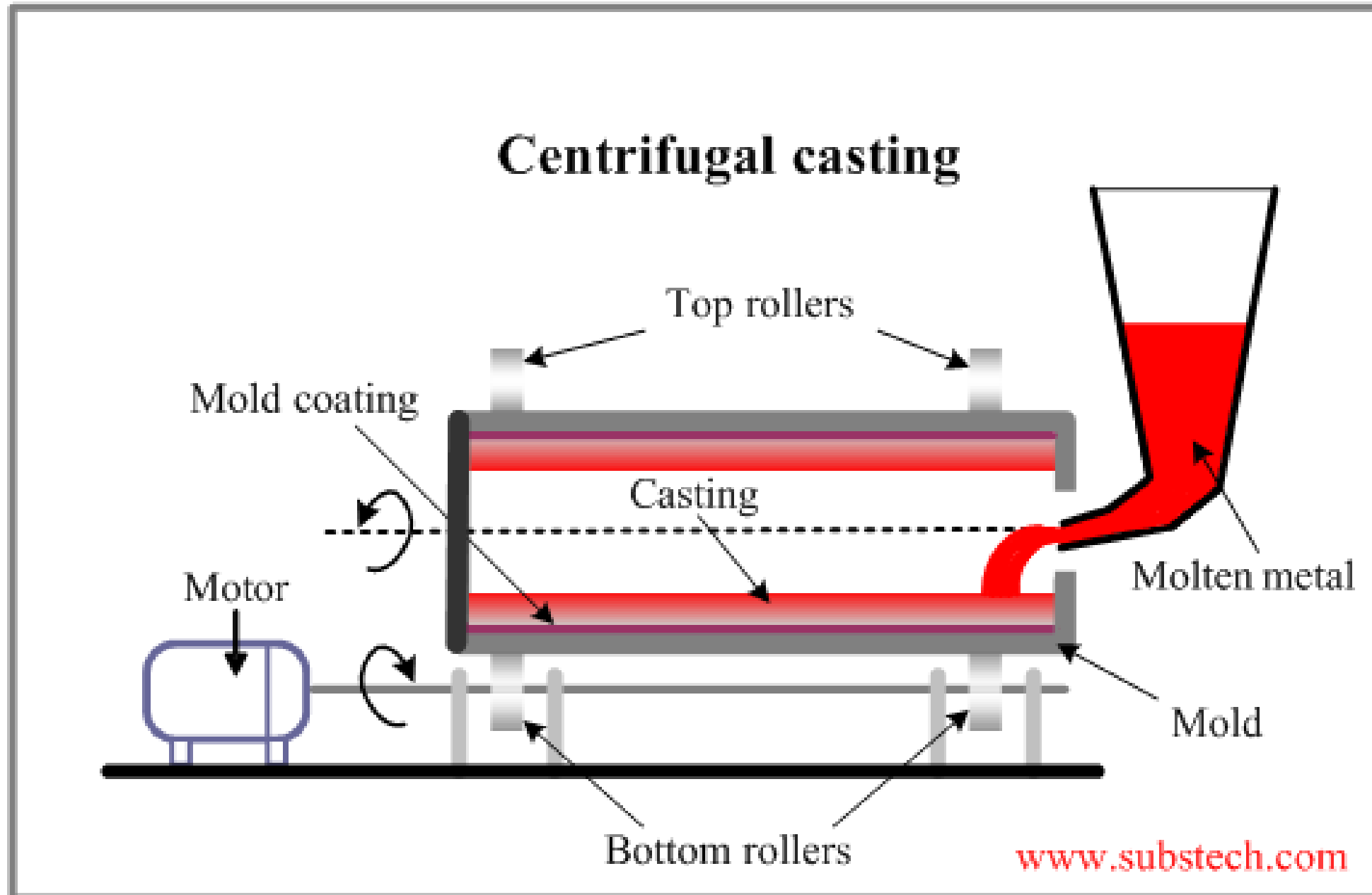
Centrifugal Casting



- No cores are therefore required in casting of hollow parts although solid parts can also be cast by this process.
- The centrifugal casting is very suitable for axisymmetric parts.
- Very high strength of the casting can be obtained. Since the molten metal is fed by the centrifugal action, the need for complex metal feeding system is eliminated. Both horizontal and vertical centrifugal castings are widely used in the industry



Centrifugal Casting



Hollow Cylindrical Pipes

Source : substech.com



Centrifugal Casting



Advantages

1. Relatively very light impurities move inwards towards center. So they can be removed easily thus helping in producing sound castings.
2. Gates and risers are not needed.
3. This technique is best suited for the mass production of symmetrical objects and Castings yield is very high in some cases it is even equal to 100%.
4. Castings acquire high density, high mechanical strength and fine grained structure.
5. Inclusions and impurities are lighter.
6. These castings have a directional solidification starting from outside to inside.



Centrifugal Casting



Disadvantages

1. Skilled labors are to be employed for this process.
2. An inaccurate diameter of the inner surface of the casting.
3. Only some shapes can be generated by this casting process.
4. Not all alloys can be cast in this way.
5. Centrifugal castings require very high investments.



Fettling of Sand casting

- Fettling is the means by which a crude casting is turned into a cost effective quality component that meets all the standards required by the customer.
- In context with the casting process, fettling means the removal of unwanted metal, e.g. flashings, risers etc.
- It can include processes like chipping, grinding, shot blasting etc.



<https://tinyurl.com/y4eylawu>



Fettling of Sand casting

- It involves the removal of the cores, gates, sprues, runners, risers and chipping of any of unnecessary projections on the surface of the castings.

- Fettling operations can be divided into different stages:

1. Removal of Gate and Risers
2. Shot Blasting to remove the sticking sands on the casting
3. Removal of fins, rough spots and unwanted projections by grinding



<https://tinyurl.com/y2ek7vy5>

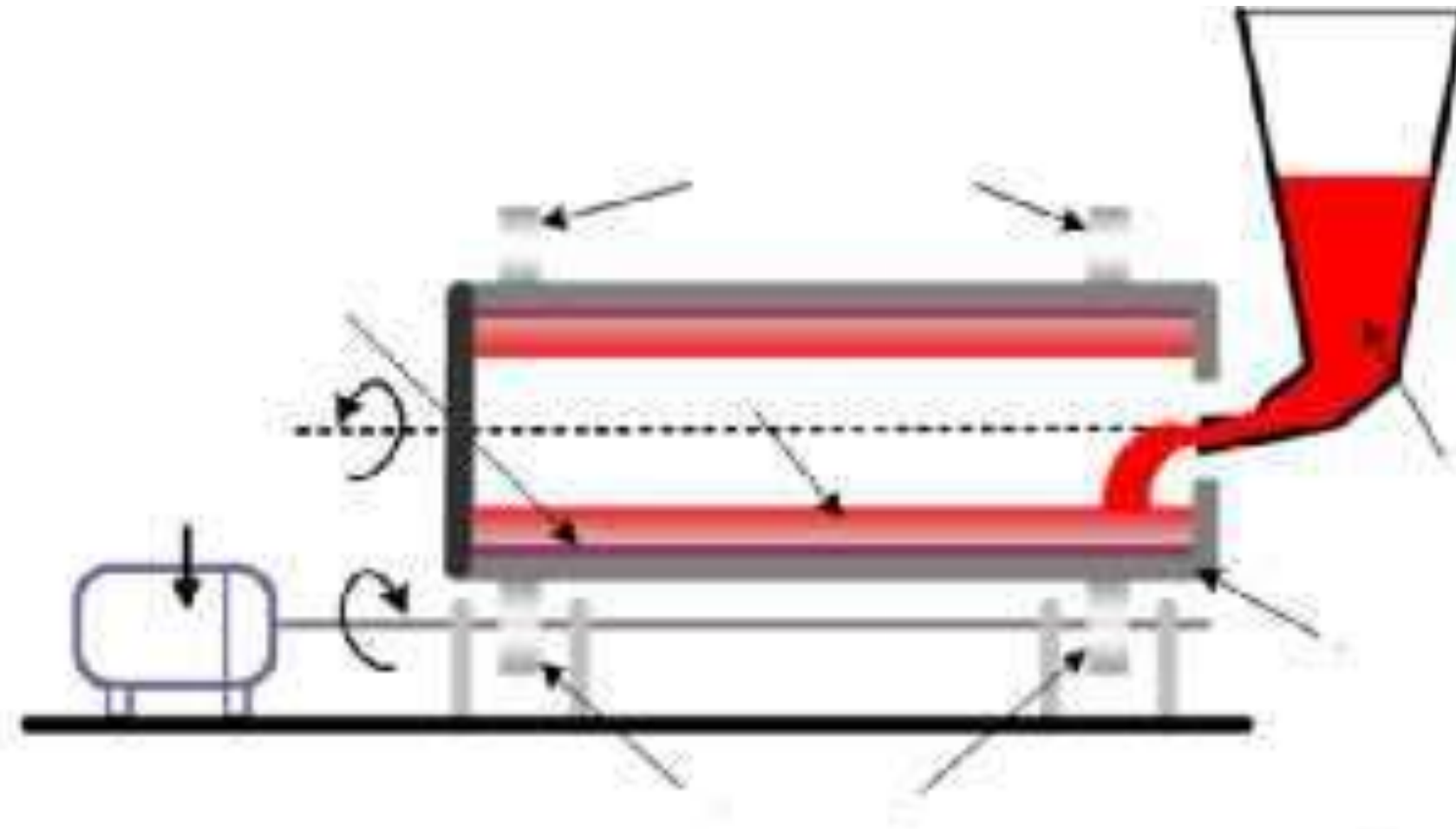


Assessment



Workbook Questions

1. Name the parts in the centrifugal casting process





Assessment



Workbook Questions

2. In a _____ method , the molten metal is poured and allowed to solidify while the mould is revolving.

3. For ferrous alloys, the breaking of mould should be done at a temperature_____

a) 780 °C

b) 850 °C

c) above 700 °C

d) below 700 °C



Assessment



4. Which of the following methods is best for cleaning of sand particles sticking to the casting surface?

- a) Chipping b) Shot blasting c) Grinding d) Hammering

5. In the hot chamber die casting process, which of the following parts is used for the pumping of liquid metal into the cavity?

- a) Accumulator b) Slug c) Guide Pin d) Gooseneck

6. . Which of the following ways of cooling is used for the maintaining of die temperature?

- a) Natural air cooling b) Forced Air Cooling c) Water Channel cooling d) Liquid Nitrogen cooling



THANK YOU