

Manufacturing Process (KME-404)

CASTING DEFECTS

- A casting defect is an irregularity in the metal casting process that is undesired.
- It can also be defined as conditions in a casting that must be corrected or removed, or the casting must be rejected.
- It may sometimes be tolerated, sometimes eliminated with proper moulding practice or repaired using methods such as welding, metallization etc.
- There are many types of defects which result from many different causes. Some of the remedies to certain defects may be the cause for another type of defect.

CASTING DEFECTS

- Defects in castings occur due to various causes. Although it is quite difficult to establish a relationship between defects & causes, casting defects are roughly broken down into five main categories :
 - ❖ Gas Defects
 - ❖ Moulding Material Defects
 - ❖ Pouring Metal Defects
 - ❖ Metallurgical Defects

CASTING DEFECTS



Blow



Scar



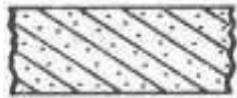
Blister



Gas holes



Pin holes



Porosity



Drop



Nonmetallic inclusion



Dirt



Wash



Buckle



Scab



Rat tail



Penetration



Swell



Misrun



Cold shut



Hot tear



Shrinkage cavity



Mould shift



Core shift

MISMATCH



➤ The casting that does not match at the parting line is known as Mismatch or Mould shift.

➤ Causes :

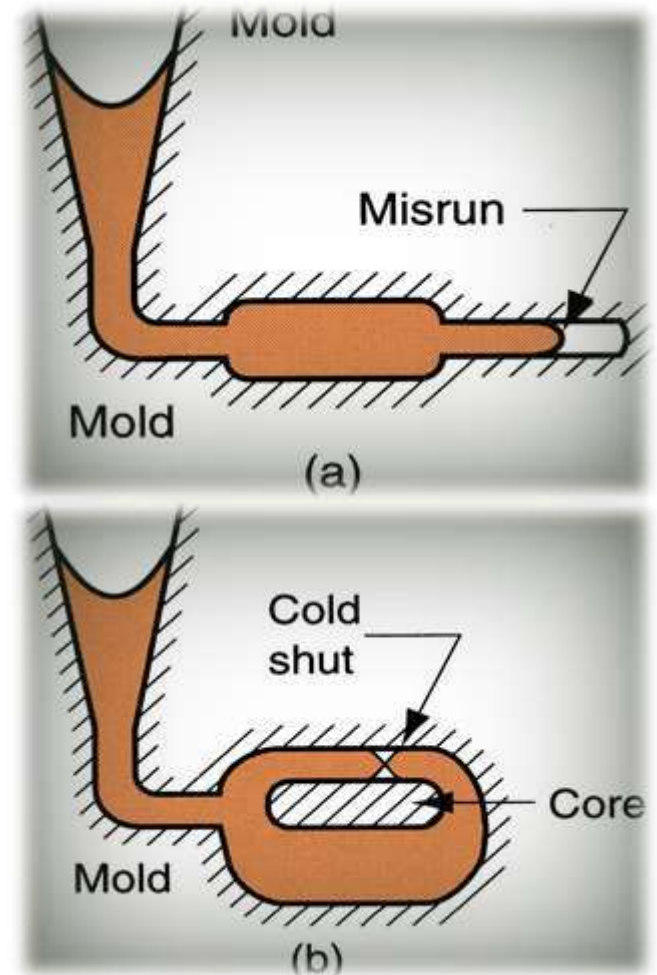
- Worn out or bent clamping pins.
- Misalignment of two halves of pattern.
- Improper location & support of core.
- Faulty core boxes.
- Loose dowels.

➤ Remedies :

- Increase strength of mould & core.
- Provide adequate support to core.
- Proper alignment of two halves of the pattern.
- Proper clamping of mould box.
- Repair or replace dowels & pin causing mismatch.

MISRUN & COLD SHUTS

- When the metal is unable to fill the mould cavity completely & thus leaves unfilled cavities, it is called as misrun defect.
- When two metal streams meeting in the mould cavity, do not fuse together properly, causing discontinuity or weak spot inside casting, it is called as cold shuts.



MISRUN &

COLD SHUTS

➤ Causes :

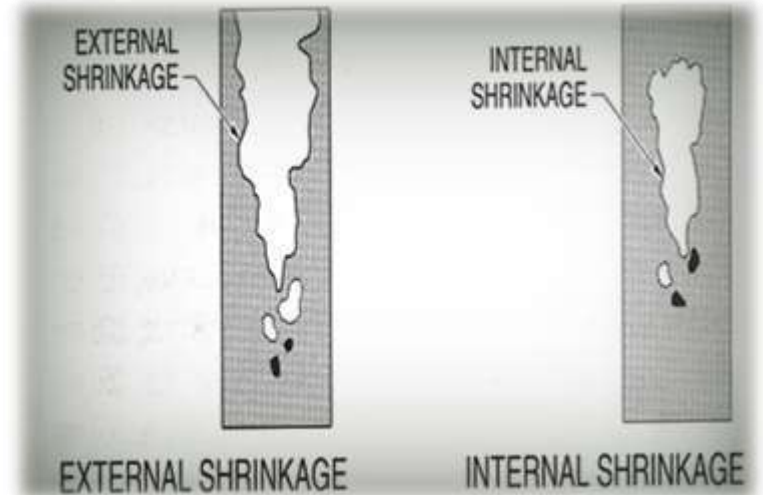
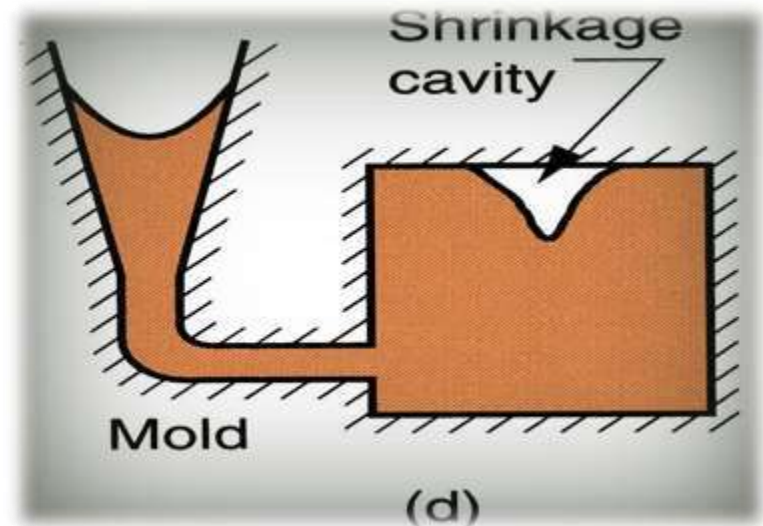
- Low pouring temperature.
- Faulty gating system design.
- Too thin casting sections.
- Slow and intermitted pouring.
- Improper alloy composition.
- Use of damaged pattern.
- Lack of fluidity in molten metal.

➤ Remedies :

- Smooth pouring with the help of monorail.
- Properly transport mould during pouring.
- Providing appropriate pouring temperature.
- Modifying the gating system design.

SHRINKAGE CAVITY

- Shrinkage cavity is a void on the surface of the casting caused mainly due to uncontrolled and haphazard solidification of the metal.
- Shrinkage defects can be split into two different types:
 - 1) External shrinkage
 - 2) Closed shrinkage defects.



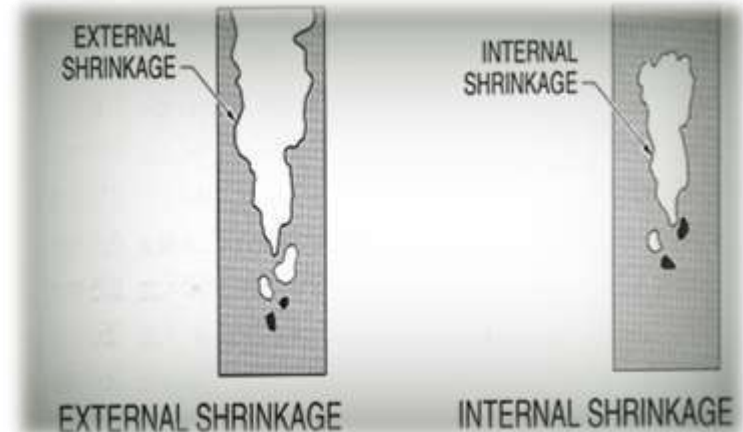
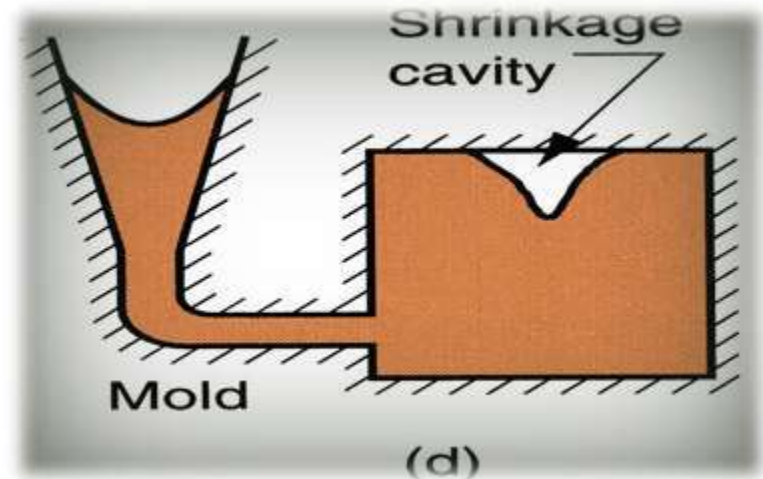
SHRINKAGE CAVITY

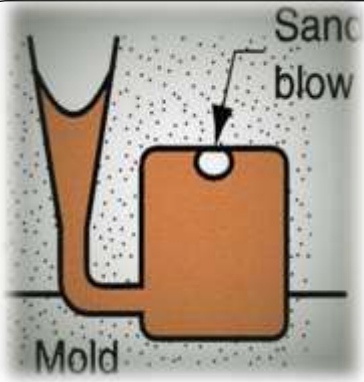
➤ Causes:

- Inadequate and improper gating & risering system.
- Too much high pouring temperature.
- Improper chilling.

➤ Remedies:

- Ensure proper directional solidification by modifying gating, risering & chilling system.





BLOW HOLES



- Balloon shaped gas cavities caused by release of mould gases during pouring are known as blow holes.

➤ Causes :

- Ramming is too hard.
- Cores are not sufficiently baked.
- Excess moisture content.
- Low sand permeability.
- Excessive fineness of sand grains.
- Rusted chills, chaplets & inserts.
- Presence of gas producing ingredients.

➤ Remedies :

- Baking of cores properly.
- Control of moisture content in moulding sand.
- Use of rust free chills, chaplets & inserts.
- Provide adequate venting in mould and cores.
- Ramming the mould less harder.

POROSITY



- Porosity is in the form of cavities caused due to gas entrapment during solidification.

➤ Causes :

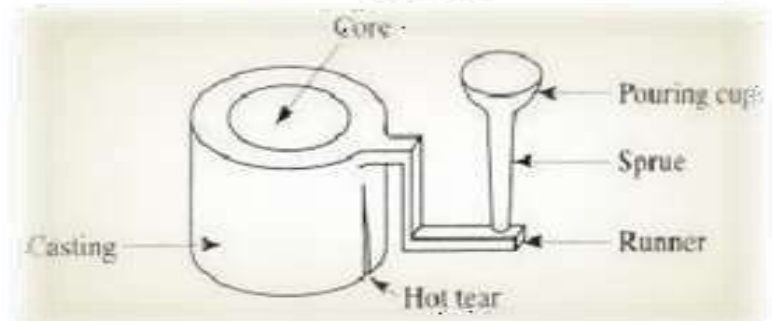
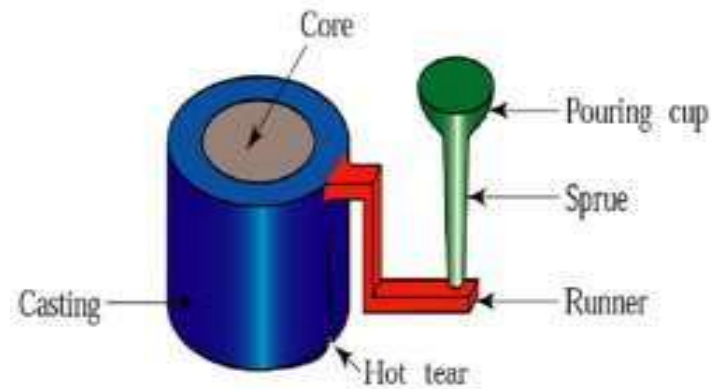
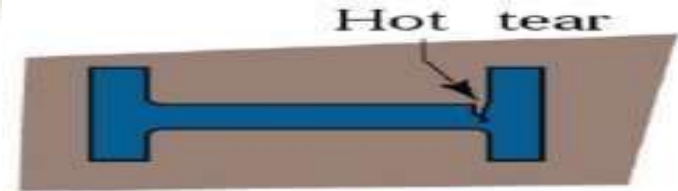
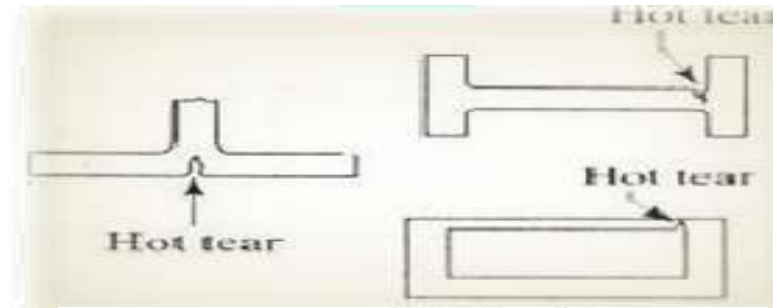
- High pouring temperature.
- Gas dissolved in metal charge.
- Less flux used.
- Molten metal not properly degassed.
- Slow solidification of casting.
- High moisture and low permeability of mould.

➤ Remedies :

- Regulate pouring temperature
- Control metal composition.
- Increase flux proportions.
- Ensure effective degassing.
- Modify gating and risering.
- Reduce moisture and increase permeability of mould.

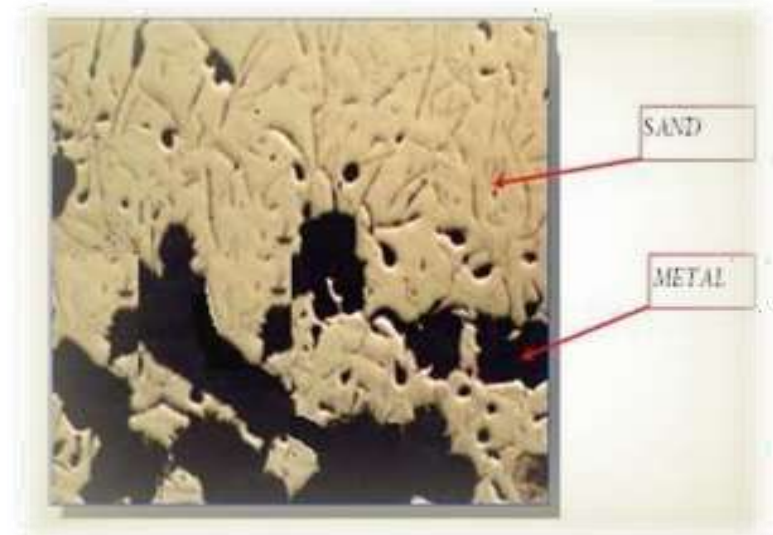
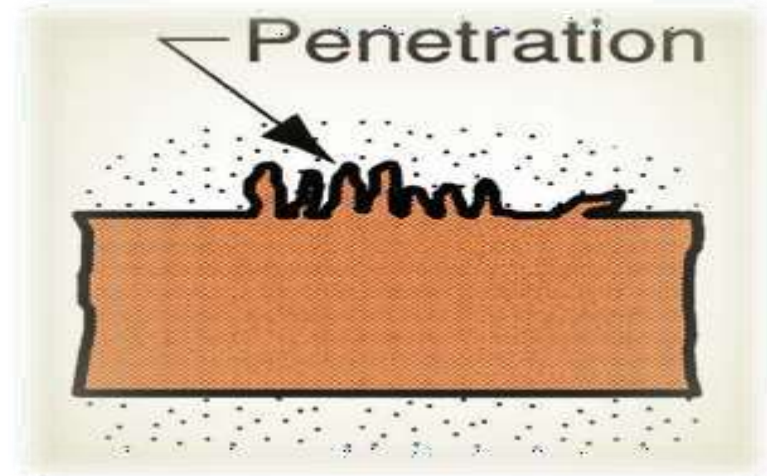
HOT TEARS or HOT CRACKING

- Hot tears are ragged irregular internal or external cracks occurring immediately after the metal have solidified.
- Causes :
 - Lack of collapsibility of core & mould.
 - Hard ramming of mould.
 - Faulty casting design.
- Remedies :
 - Providing softer ramming.
 - Improve casting design.
 - Improve collapsibility of core & mould.



METAL PENETRATION

- Penetration occurs when the molten metal flows between the sand particles in the mould.
- Causes :
 - Low strength of moulding sand.
 - Large size of moulding sand.
 - High permeability of sand.
 - Soft ramming.
- Remedies :
 - Use of fine grain with low permeability.
 - Appropriate ramming.



PIN HOLES

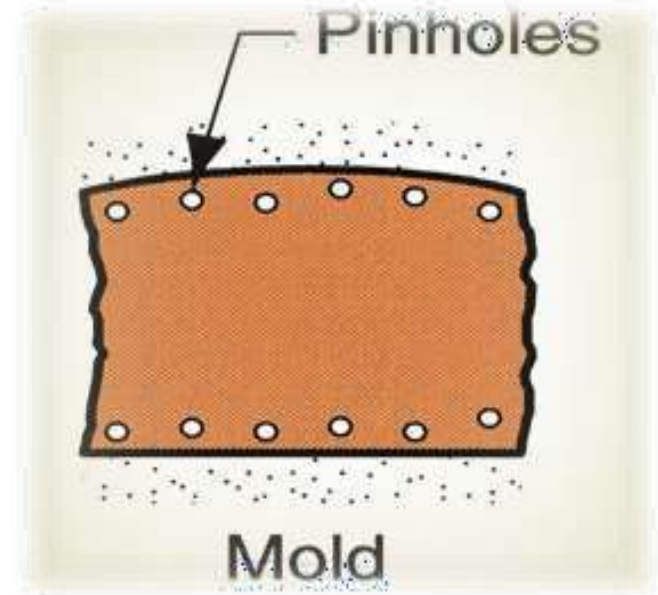
➤ Formation of many small gas cavities at or slightly below surface of casting is called as pin holes.

➤ Causes :

- Sand with high moisture content.
- Absorption of hydrogen/carbon monoxide gas in the metal.
- Alloy not being properly degassed.
- Sand containing gas producing ingredients.

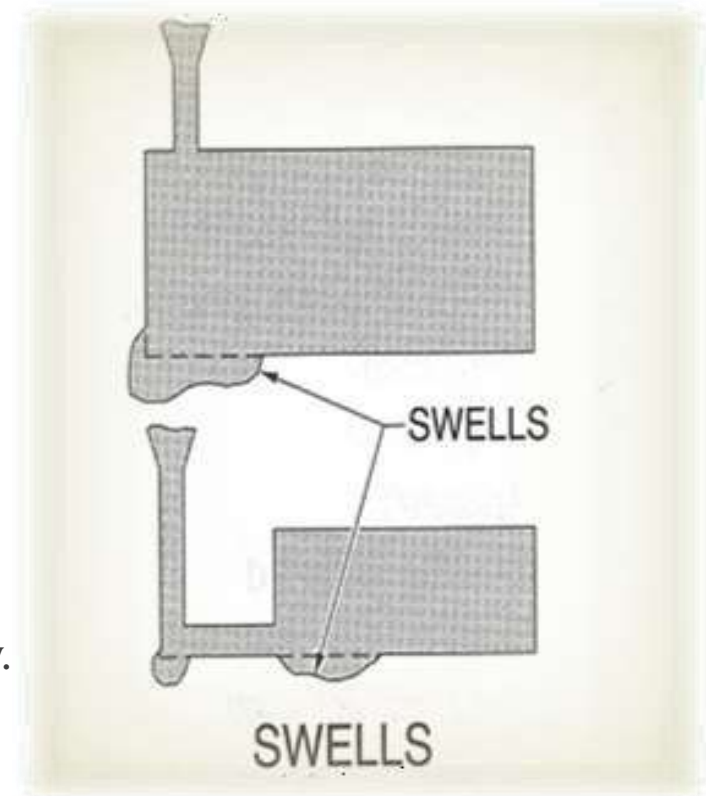
➤ Remedies :

- Reducing the moisture content & increasing permeability of moulding sand.
- Employing good melting and fluxing practices.
- Improving a rapid rate of solidification.



SWELL

- A swell is an enlargement of mould cavity by localized metal pressure.
- Causes :
 - Insufficient or soft ramming.
 - Low strength mould & core.
 - Mould not being supported properly.
- Remedies :
 - Sand should be rammed evenly and properly.
 - Increase strength of mould & core.



DROP

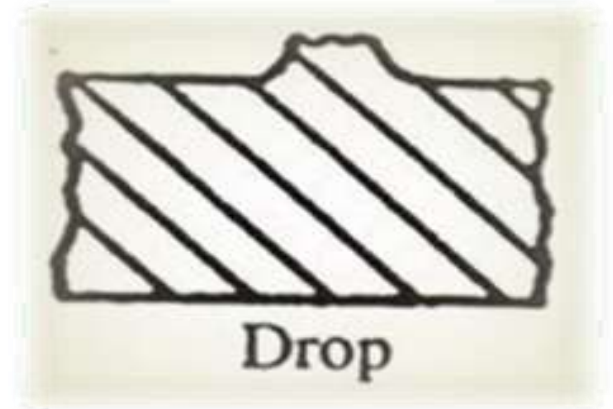
- Drop is a projection on drag part of casting due fall of its cope part.

- Causes :

- Causes
 - Low green strength of the moulding sand.
 - Low mould hardness.
 - Insufficient reinforcement of sand projections in the cope.

- Remedies :

- Remedies
 - Moulding sand should have sufficient green strength.
 - Provide adequate reinforcement to sand projections and cope by using nails and gagers.
 - Ramming should not be too soft.



RAT TAILS or BUCKLES

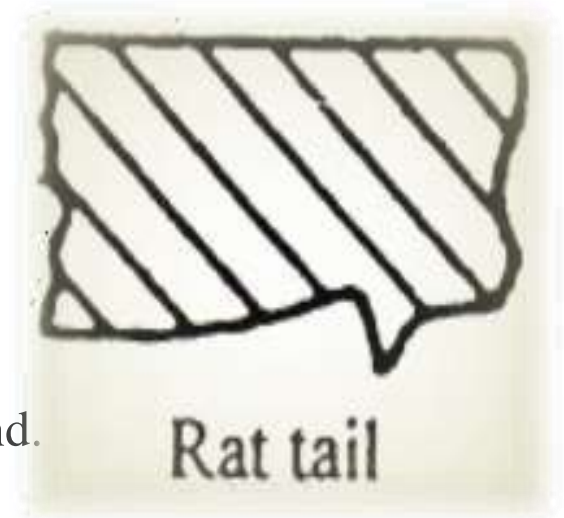
- Slight compression failure of a thin layer of moulding sand is called as rat tails & more severe compression failure is called as buckles i.e. Buckling of sand.

- Causes :

- Excessive mould hardness.
- Lack of combustible additives in the moulding sand.
- Continuous large surfaces on the casting.

- Remedies :

- Suitable addition of combustible additives to moulding sand.
- Reduction in mould hardness.
- Modifications in casting design.



Thank

you

