

Module 4

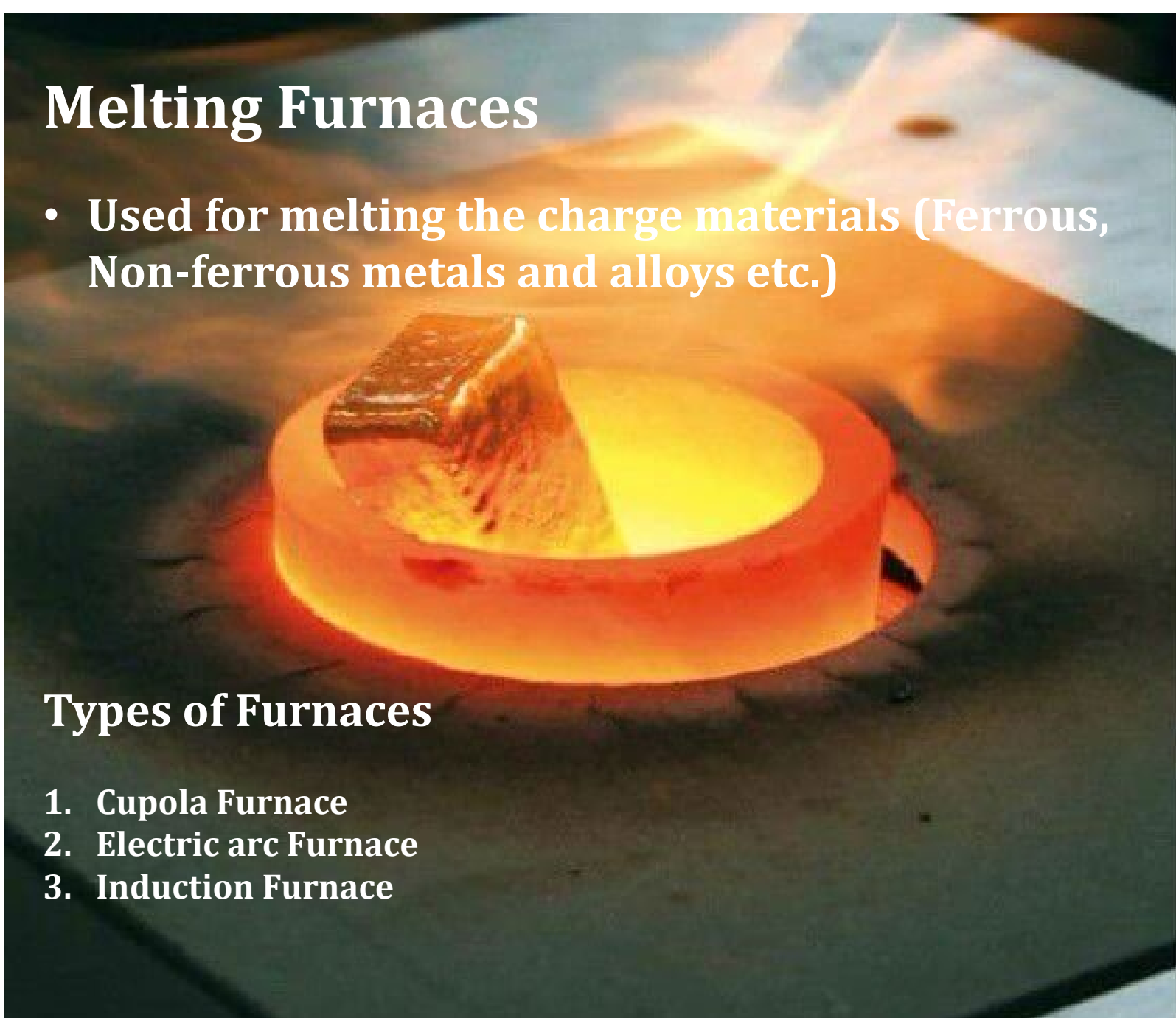
Melting Technology and Casting Defects

Melting Furnaces

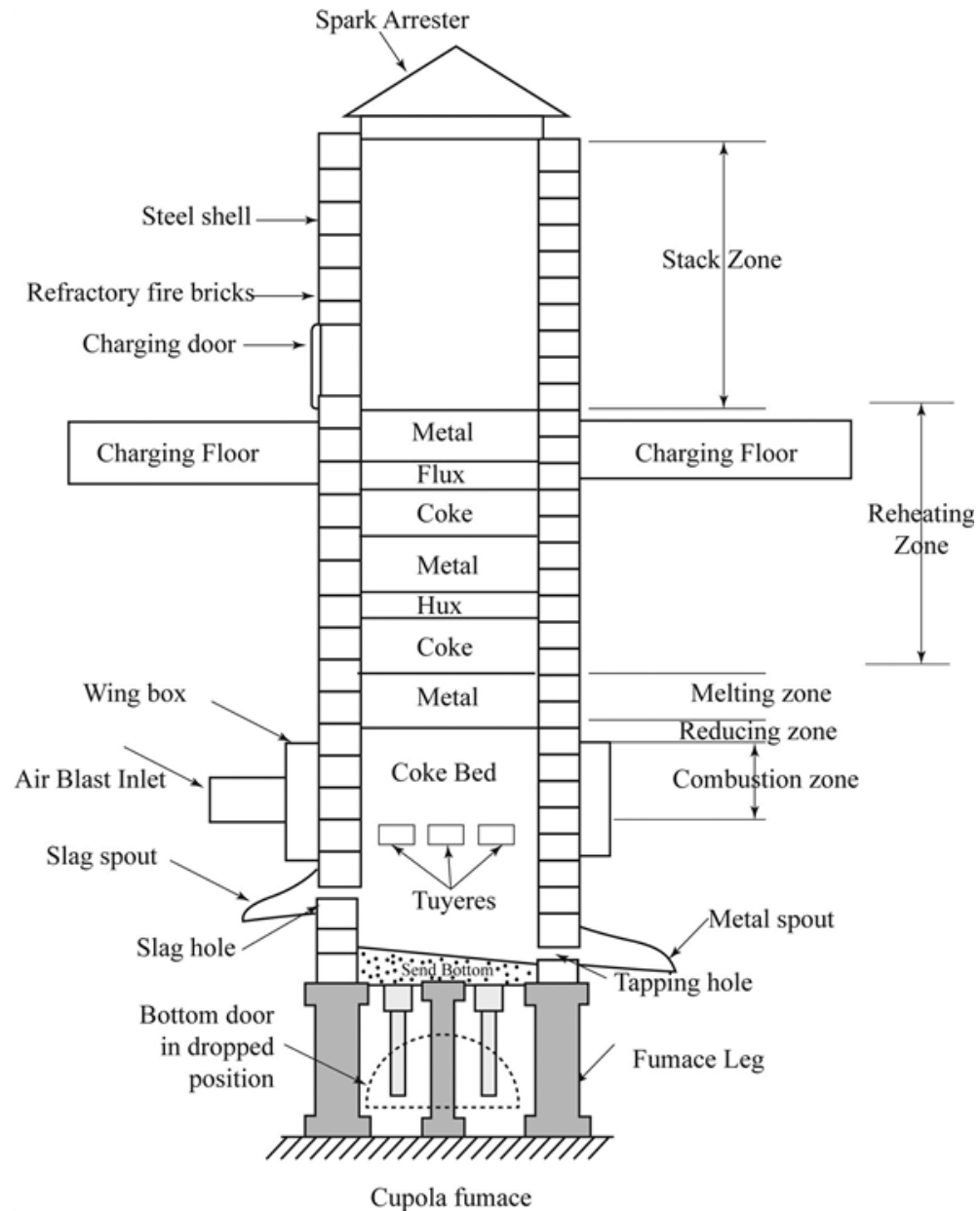
- Used for melting the charge materials (Ferrous, Non-ferrous metals and alloys etc.)

Types of Furnaces

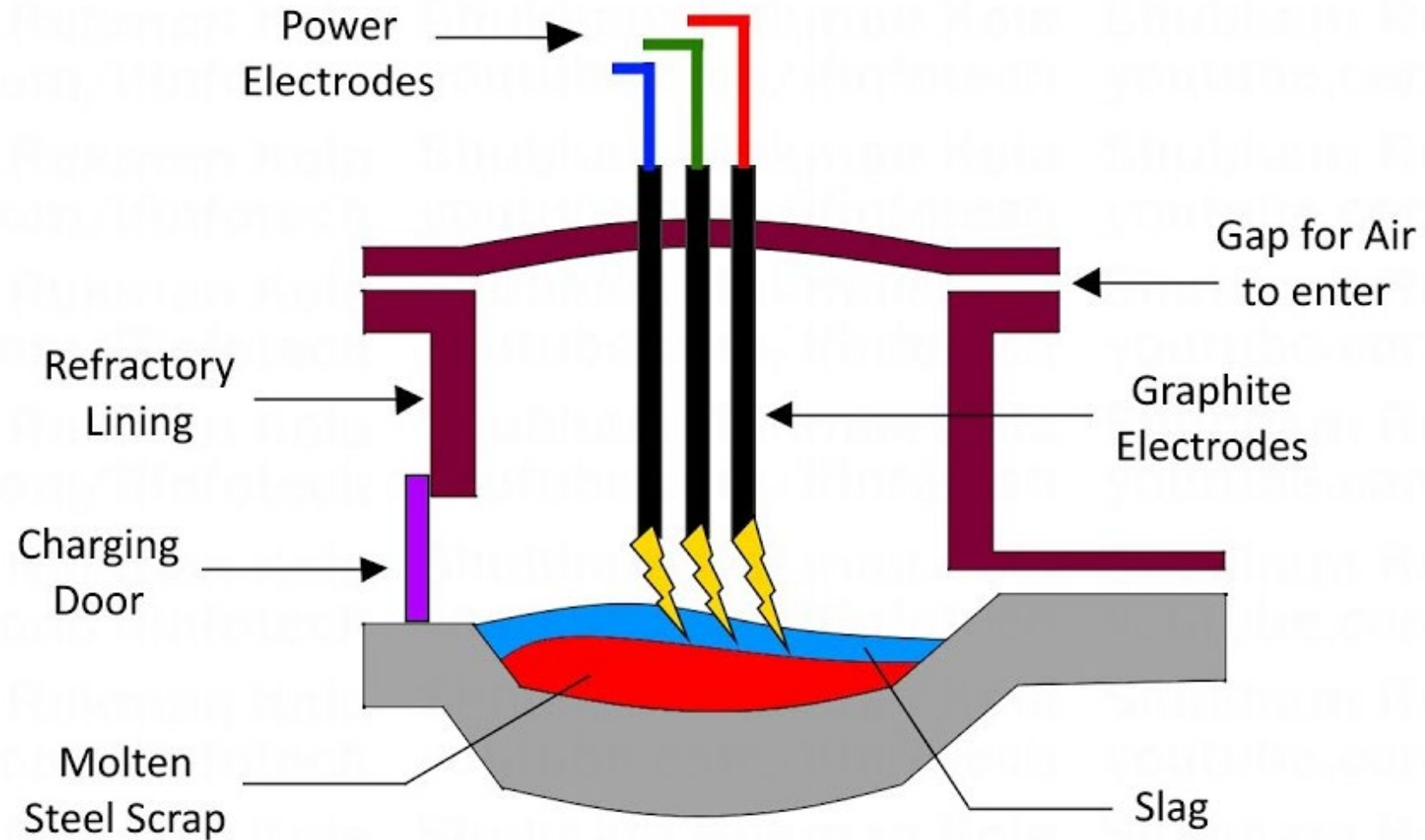
1. Cupola Furnace
2. Electric arc Furnace
3. Induction Furnace



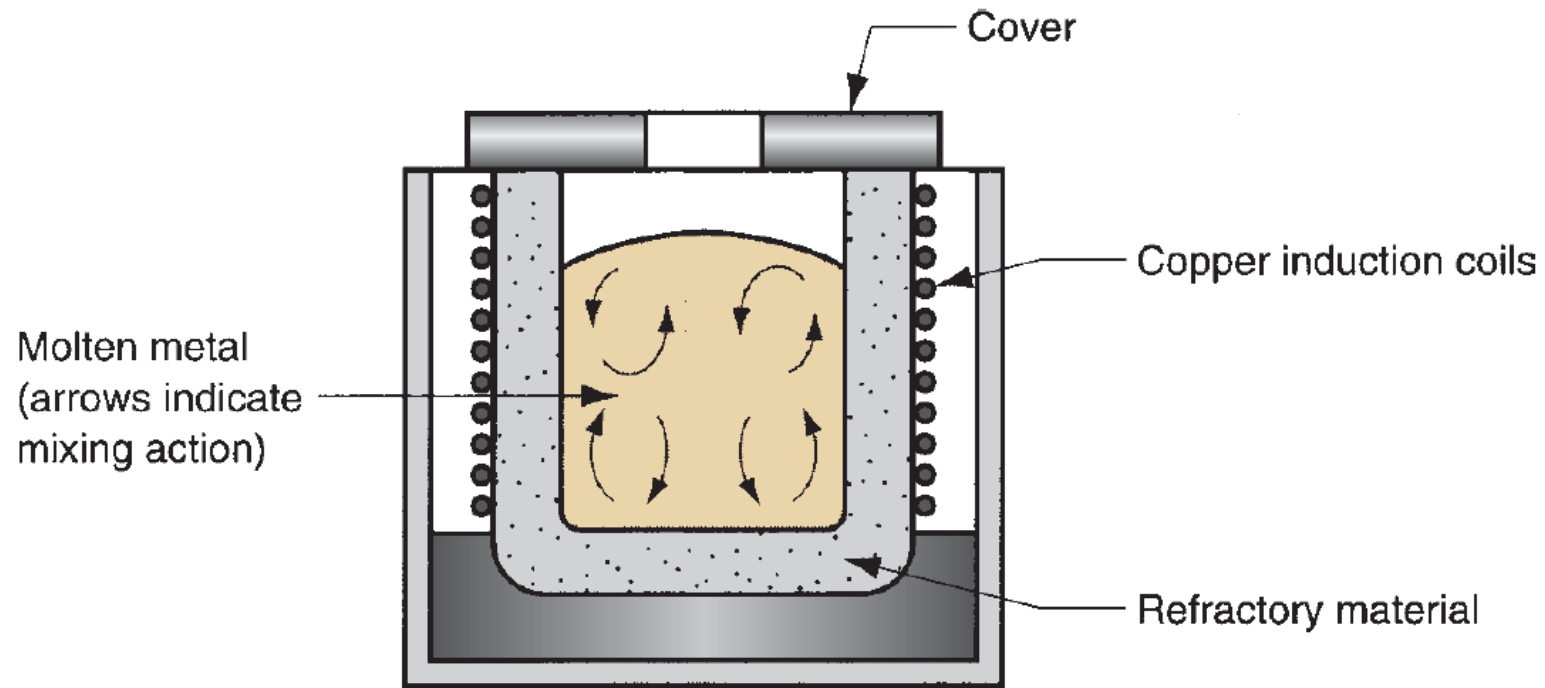
Cupola Furnace



Electric arc Furnace



Induction Furnace



Pouring of molten metal



Direct pouring from furnace



Crane Ladle



Two man Ladle

Cleaning(Fettling) of castings

After the casting has solidified and been removed from the mold, a number of additional steps are usually required. These operations include

(1) trimming, (2) removing the core, (3) surface cleaning, (4) inspection, (5) repair, if required, and



Heat Treatment

Castings are often heat treated to enhance their properties, either for subsequent processing operations such as machining or to bring out the desired properties for application of the part.

Types of Heat treatment

- Annealing
- Normalizing
- Quenching



Melting Practices

1. Collection of scrap
2. Separation of ferrous and non ferrous materials from the scrap using magnetic conveyor
3. Segregation of non ferrous metals based on its density
4. Selection of melting furnace
5. Decide upon melting temperature and super heating temperature
6. Fluxing :
NaCl or KCl (500 g/250 kg of metal) at the temperature of melt at 600- 700° C
Dross formation on the top of the melt
7. Inoculants or grain refiners : Si /Sr can be added in to the melt
8. Degassing : Purging of Nitrogen gas from the bottom of molten metal inside the furnace helps to bring down the hydrogen level results in porous free casting

Melting practice of Aluminium and its alloys

Melting Furnace : Electric arc/Induction furnace

Melting temperature : 660°C for Pure Al and 590-650°C for Al alloys

Alloying elements : Cu, Si, Mn, Mg, Zn etc

Si – improves strength, corrosion resistance, flowability

Cu- improves strength, corrosion resistance, machinability

Mn- denser, retains the strength at elevated temperature

Mg- improves the corrosion resistance and strength

Zn-improves castability, strength, hardness

Sr- Grain refinement

Fluxing : NaCl/KCl

Grain refiners : Sr for refining the grain structure

Degassing : N₂ gas

Casting Defects

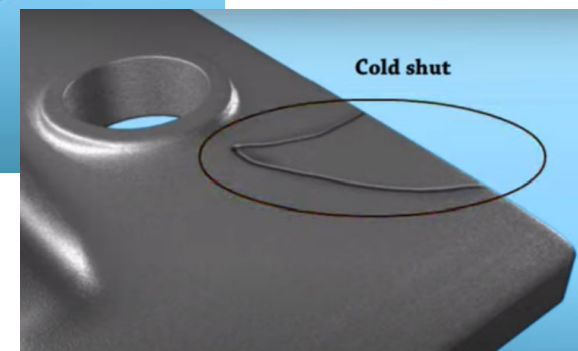
An undesirable irregularity in the cast

Types of Casting Defects

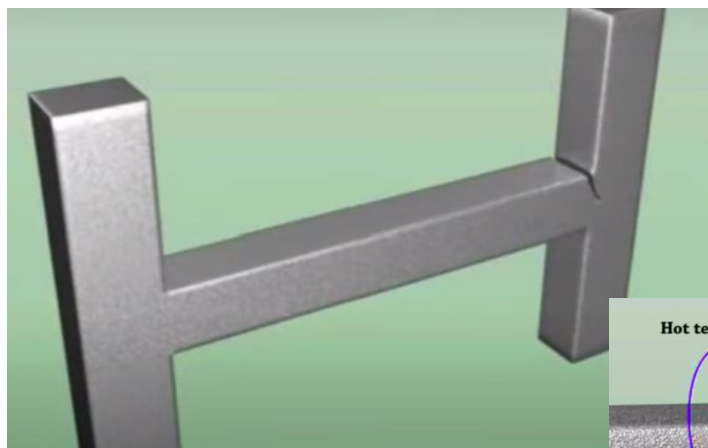




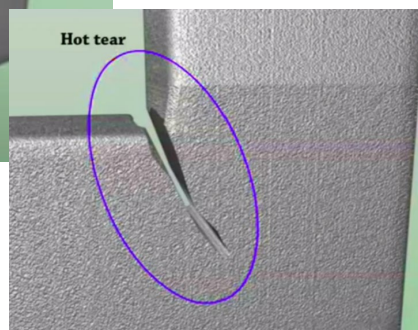
Misrun/Runout

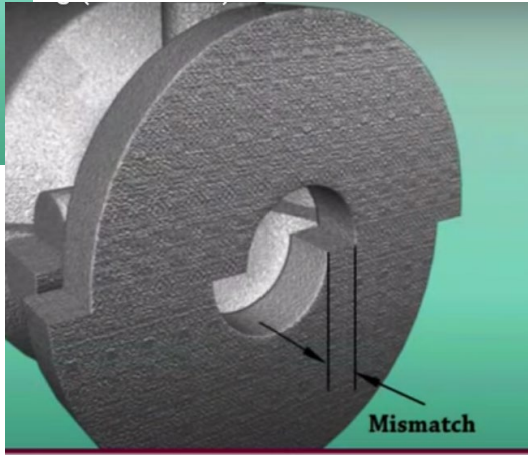


Cold shut

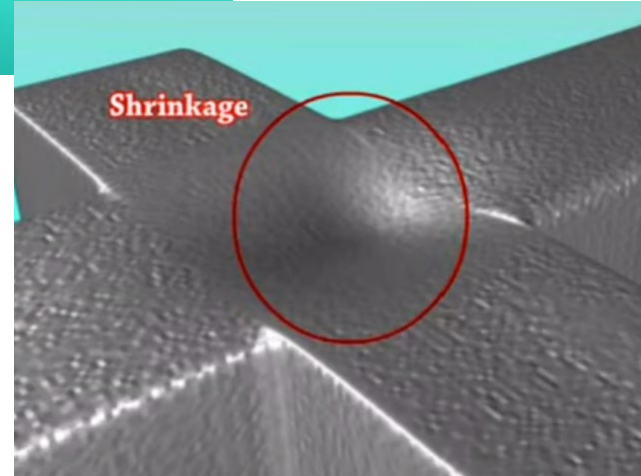
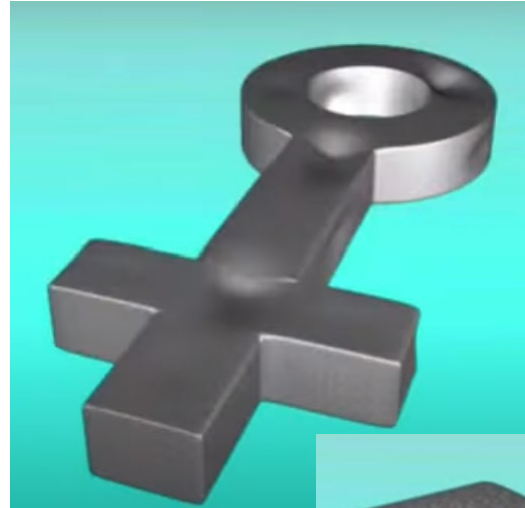


Hot tear





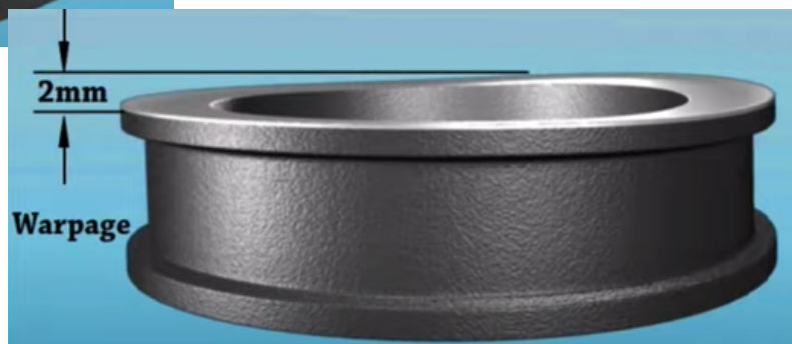
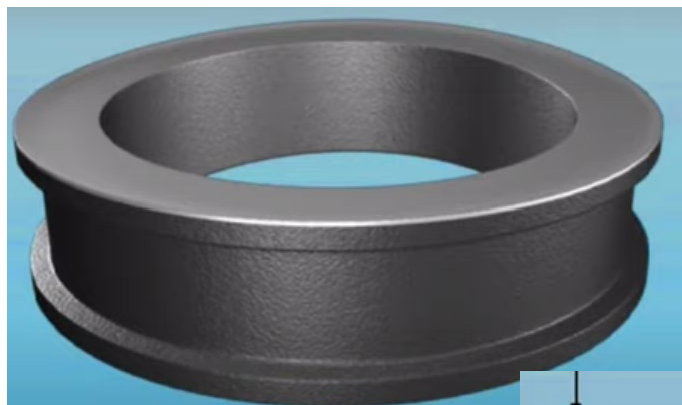
Mismatch



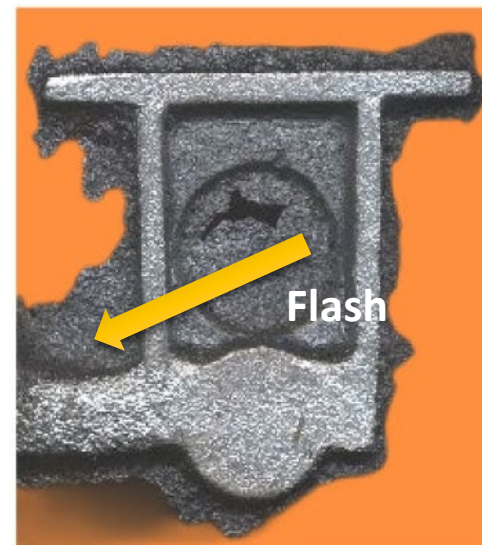
Shrinkage



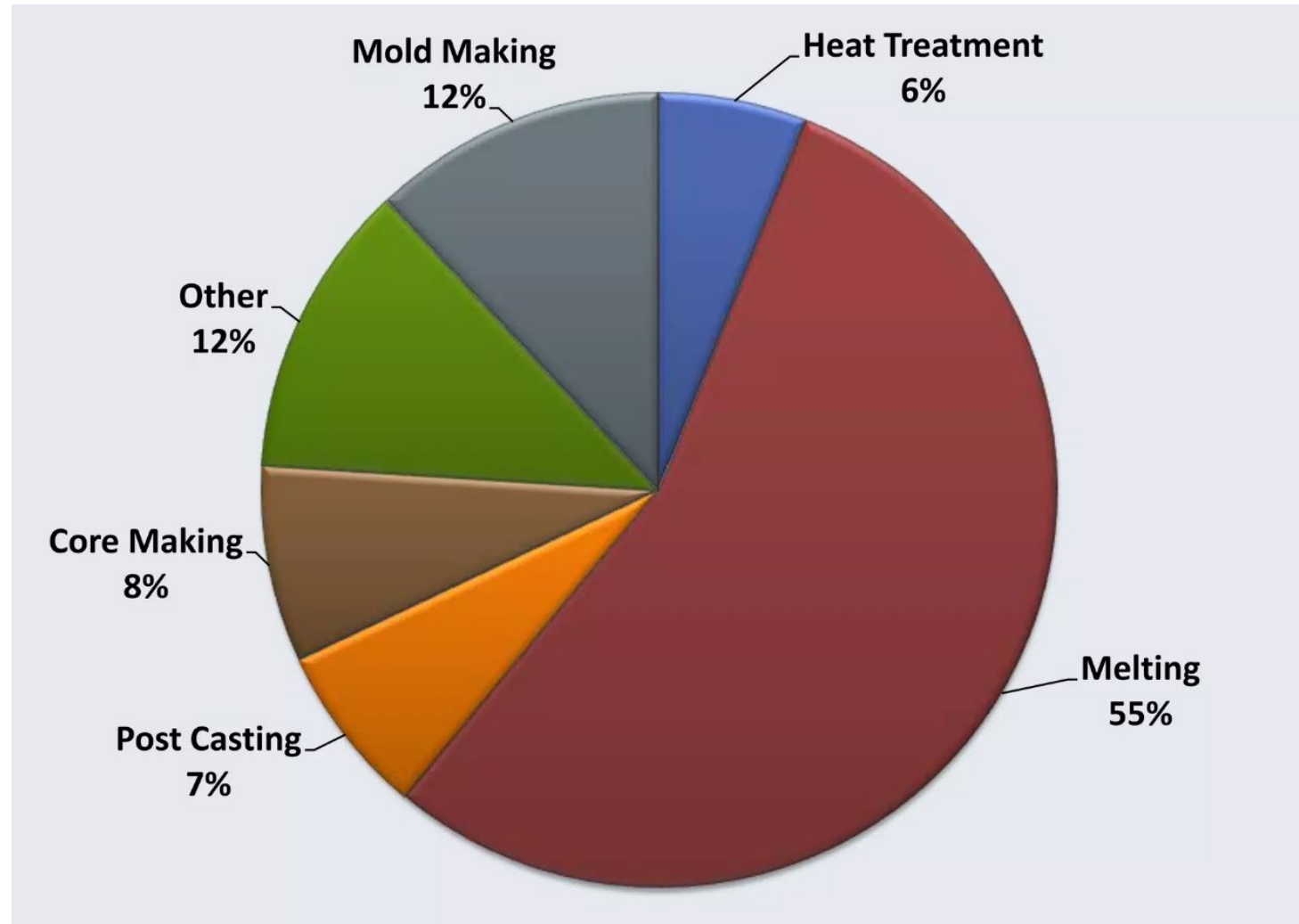
Blowholes



Warpage



Energy conservation in Foundries



ENERGY SAVING OPPORTUNITIES

1. SCRAP SELECTION AND PREPARATION
2. CHARGING
3. MELTING
4. ALLOYING / REFINING / TREATMENT / SAMPLING
5. HOLDING
6. TAPPING / LADLES
7. TRANSPORTING METAL
8. POURING
9. MAINTENANCE OF PLANT AND EQUIPMENT

