



IIT ROORKEE



NPTEL ONLINE
CERTIFICATION COURSE

MELTING AND CASTING OF CAST METALS

Production of Steel Castings

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Steel

- High T.S. and Ductility (combined)
- Properties can be controlled within wide limits by controlling its composition, specifically C content
- Steel castings show isotropic behaviour
- Ease of welding
- Extensive risering required
- High pouring temperature

Molding processes

- Dry sand/core sand/skin dried/cement bonded sands are normally used
- Permanent mold casting not used (very few)
- Graphite molds may be used with precaution
- In green sand molding, care has to be taken for high values of refractoriness, durability, high permeability and low moisture content
- Investment/shell/ceramic molding methods are also used.
- Ramming may be by hand/jolt.

- Cores should be having high permeability (because of subjection to high temp), hollow cores are also preferred.
 - Defects likely to appear:
 - Hot tear
 - Metal penetration
 - Cerioxide formation
- Solidification factors
 - Fluidity
 - Temperature level of solidification (promotes progressive solidification)
 - Temperature range
 - Thermal conductivity of mold and molten steel

Steel Melting

- Open hearth (acidic/basic)
- Electric arc (acidic/basic)
- Converter process(acidic/basic)
- Electric Induction
- Vacuum melting

Treatments practiced:

- Oxygen Injection
- Deoxidation
- Heat treatment

Casting of steels

- To eliminate shrinkage, all casting must be fed in heaviest section
- No carbonaceous material or washes
- Use of new facing sand
- Metal should be deoxidized before pouring (use of Al, Mn and Si) and to remain in crucible for some time
- Ensure proper directional solidification

Gases in steel

- Main gases posing threat are oxygen, nitrogen and hydrogen
- Oxygen induces temper brittleness and decreases resistance to corrosion.
- Severity when Cr and Ti is used as alloying element
- Pin holes caused by evolution of hydrogen
- Nitrogen forms Iron nitride at high temperature which converts to nitrogen and iron at lower temp, induces stone like fracture in steel
- Vacuum degassing reduces gas content

Kinds of steel

- Plain carbon steel
- Low alloy steel
- High alloy steel

THANKS

