Foundry 101
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• What is a casting?
  • An object made by pouring molten metal or other material into a mold.

• How is a casting formed/shaped?
  • By liquid (molten iron) taking the shape of the container (mold)

• Why are castings a good choice for manufacturing?
  • Castings allow for near net (almost finished) shape requiring less post production and allowing for complex shapes.
  • High production
  • Recyclability
Process of Making a Casting

- Melt
- Core making
- Molding
- Pouring
- Cooling/shakeout
- Cleaning
- Inspection/shipping
- Engineering
Melt
Melt

• Grey Iron
  • Graphite flakes
  • Brittle

• Ductile Iron
  • Graphite spheres
  • Ductile
Melt

- Cupola (raw iron)
- Holding furnace (raw iron)
- Alloy station (specific grade)
- Junker/Autopour (specific grade)

Note: This is one of many flow scenarios.
Core Making
Core Making

• What is a core and why do we use it?
  • A consumable sand product used to shape features we can’t shape with greensand
    • Undercuts
    • Internal features
Core Making

- 2 part resin coated sand.
  - Chemical reaction hardens the core.
- Vaporized catalyst to harden core. (Coldbox)
Core Making
Molding
Molding

- Green sand
  - Contains moisture (water)
- Ingredients
  - Silica sand
  - Water
  - Clay (binder)
  - Sea coal
  - Soda ash
Molding

- Sand properties
  - Compactability
    - Measure of how much the sand blend can be compacted
  - Permeability
    - Amount of air flow through compacted sand
  - Moisture
    - Moisture content within the sand blend
  - Methylene blue
    - Measure of active bond in the sand mix
  - Green strength
Molding
Molding
Pouring
Pouring

- Laser autopour
- Nitrogen pressure
- Ceramic stopper rod
- 2470°-2520°F
- Try to fill as fast as possible without erosion and turbulence (30lbs/sec)
- Pouring too slow can cause misruns or short pours as the iron cools
- Pouring too fast can cause inclusions of slag or sand
Pouring
Cooling/Shakeout
Cooling/Shakeout
Cooling/Shakeout
Finishing
Finishing

- Chipping and grinding
- Trim press
- Automated finishing
- Paint
Finishing

- Cleaning:
  - Fin removal, riser contacts, ingate contacts, scabs, salvageable defects
- Each job has a calculated finishing rate to determine output and piece rate.
- Each feature has a grinding spec
- Tools used:
  - Cup grinders
  - Pencil grinders
  - Cutting wheels
  - Hammers
Inspection/Shipping
Inspection/Shipping

• Dimensional inspection
  • Laser scanning
  • Hardline layouts
• Material testing
Engineering
Casting Design

- Parting line
- Draft
- Machine stock
- Moldability
- Defect risk
- Core(s) and core print
- Solidification analysis
- Filling design