

Casting vs Forging

101

Basic Characteristics and Processes



Basic Characteristics and Processes

- ❖ What is Casting?
- ❖ Casting Process
- ❖ What is Forging?
- ❖ Forging Process
- ❖ Advantages and Disadvantages

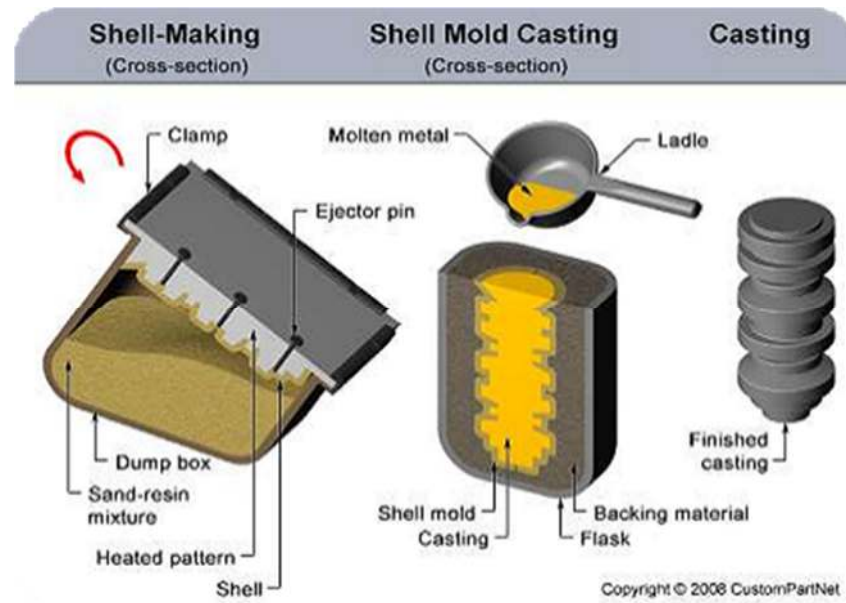


What is Casting?

- ❖ Casting is the process in which metal is heated until molten and poured into a mold or vessel to create a desired shape.

» *Example:*

- Sample shell mold casting



Casting Process

❖ Things to Consider

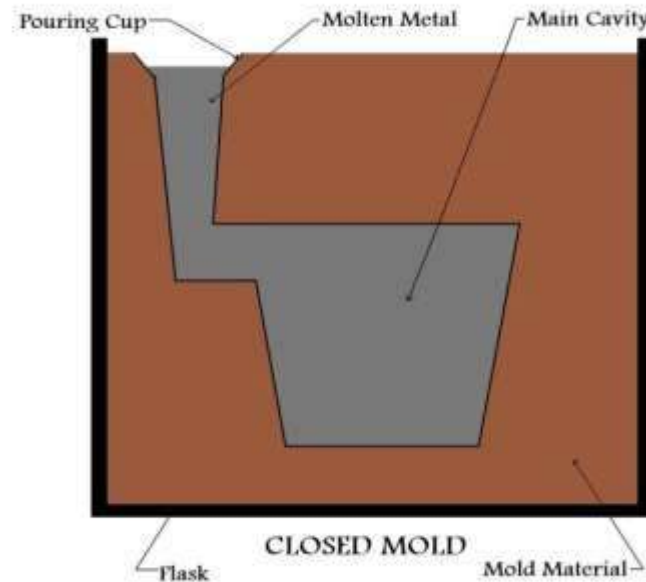
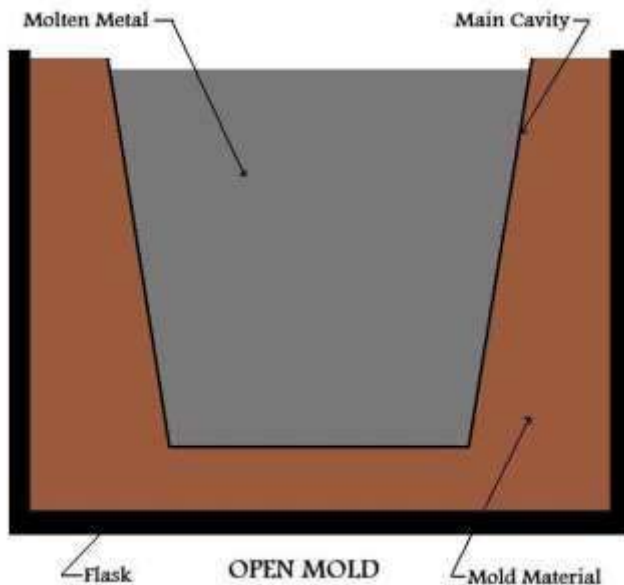
- » Surface Quality
- » Dimensional Accuracy
- » Type of Equipment
- » Type of Pattern
- » The cost of making the mold
- » How the process affects the design
- » Strength
- » Mechanical Properties



Casting Process

❖ Manufacturing the Mold

- » Open Mold
- » Close Mold



Casting Process

❖ Manufacturing the Mold

» Expendable Mold

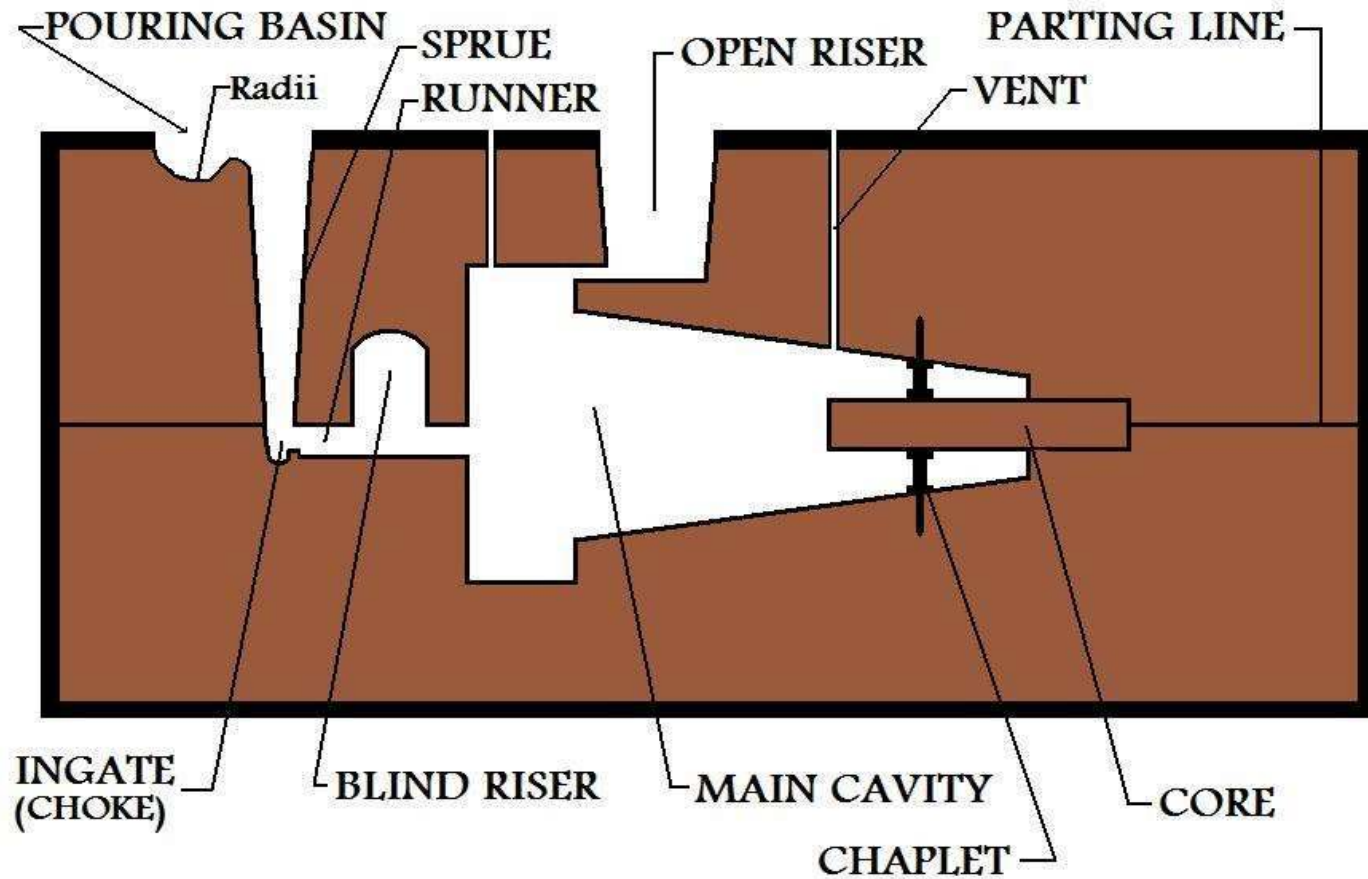
- Produce one casting
- Made of sand, plaster
- Mold can be destroyed
- More intricate patterns

» Permanent Mold

- Produce many castings
- Made of metal, refractory ceramic
- Mold has sections that can open for removal
- Need to open mold



Casting Process



GATING SYSTEM FOR CASTING



NECO INDUSTRIES, INC.

Forging vs Casting Process

Forging	Casting
<i>(At the Steel Mill)</i>	<i>(All work done at the foundry)</i>
a. Cast Ingots	1. Develop pattern and coreboxes
b. Reduce ingots to billets	2. Prepare mold and cores
	3. Melt metal
<i>(At the Forging Shop)</i>	4. Pour metal
1. Order Billets	
2. Develop dies	<i>(Cool)</i>
3. Heat billets	5. Remove component from mold
4. Perform first forging operation	6. Remove gates, risers, etc.
5. Reheat work piece	7. Heat treat
6. Perform second forging operation	8. Upgrade, if necessary
7. Reheat work piece	9. Finish machine*
8. Perform third, etc., forging operation	
9. Repeat steps 3-8 for second half of valve	
10. Machine to shape (to achieve required channels)	
11. Weld halves together	
12. Heat treat	
13. Finish machine*	



What is Forging?

- ❖ Forging is the application of thermal and mechanical energy to steel billets or ingots to cause the material to change shape while in a solid state.

- » *Example*

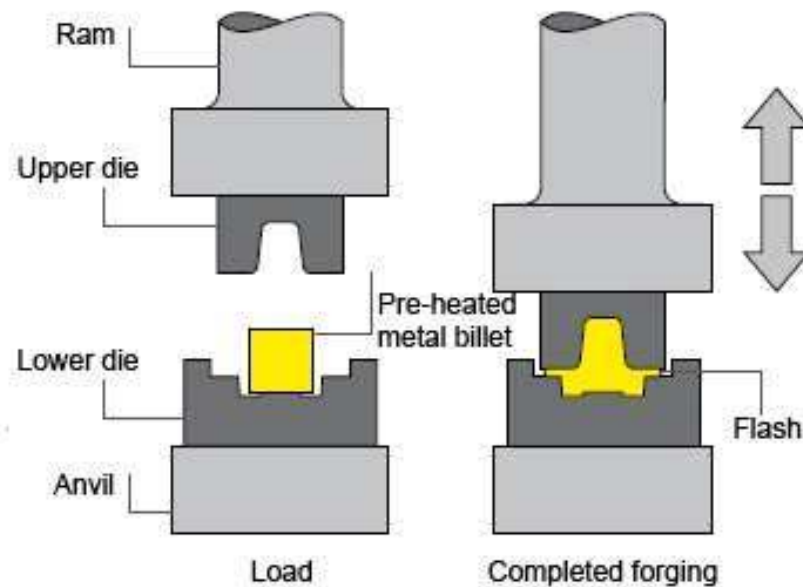
- *Sample End Product Forging of a Golf Club*



Forging Process

❖ Impression Die Forging

- » Pounds or presses metal between two dies that contains a profile cut of the shape.
- » Parts made from a few ounces to 60,000 lbs.
- » Wide range of complex shapes



Forging Process

❖ Cold Forging

» Variation of Impression Die Forging

» Contains many processes:

- Bending
- Cold drawing
- Cold heading
- Coining
- Extrusions

» Room temperature to several hundred degrees

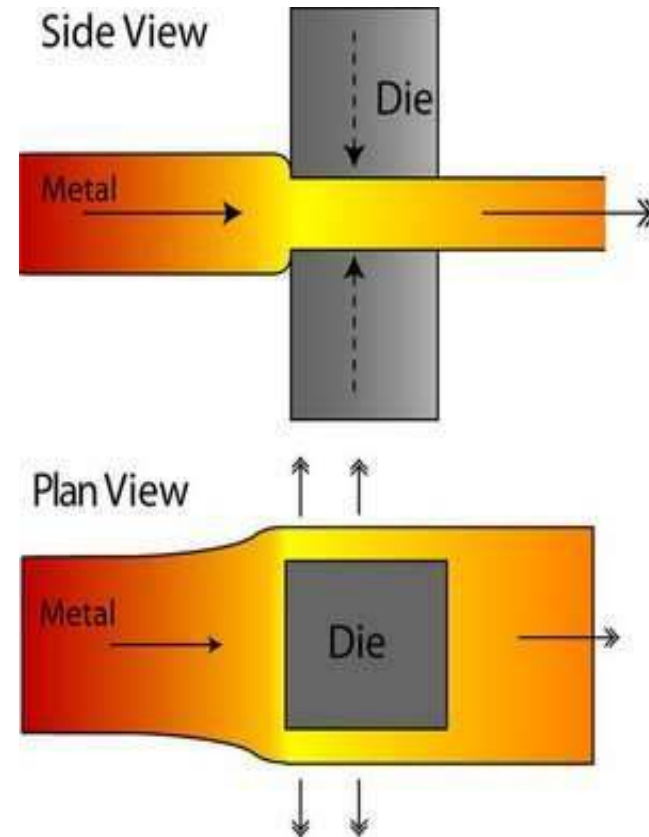


COLD HEADING/COLD FORGING



Forging Process

- ❖ Open Die Forging
 - » Performed between flat dies with no precut profiles in the dies.
 - » Movement of the work piece is the key
 - » Longer pieces are hammered into shape
 - » Many process variations, broad range of shapes



Advantages of Both Casting and Forging

❖ Casting

- » No upper size limit in casting weight
- » Large amount of alloy choices
- » Tooling is less expensive
- » Complicated parts are easier to manufacture

❖ Forging

- » Mechanically stronger end product
- » Better response to heat treatment
- » Less need of expensive alloys
- » Great wear and tear resistance

