

Manufacturing Processes – Casting and Joining

Metal Casting

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What is a metal casting?

It is one of the oldest constant volume manufacturing Processes

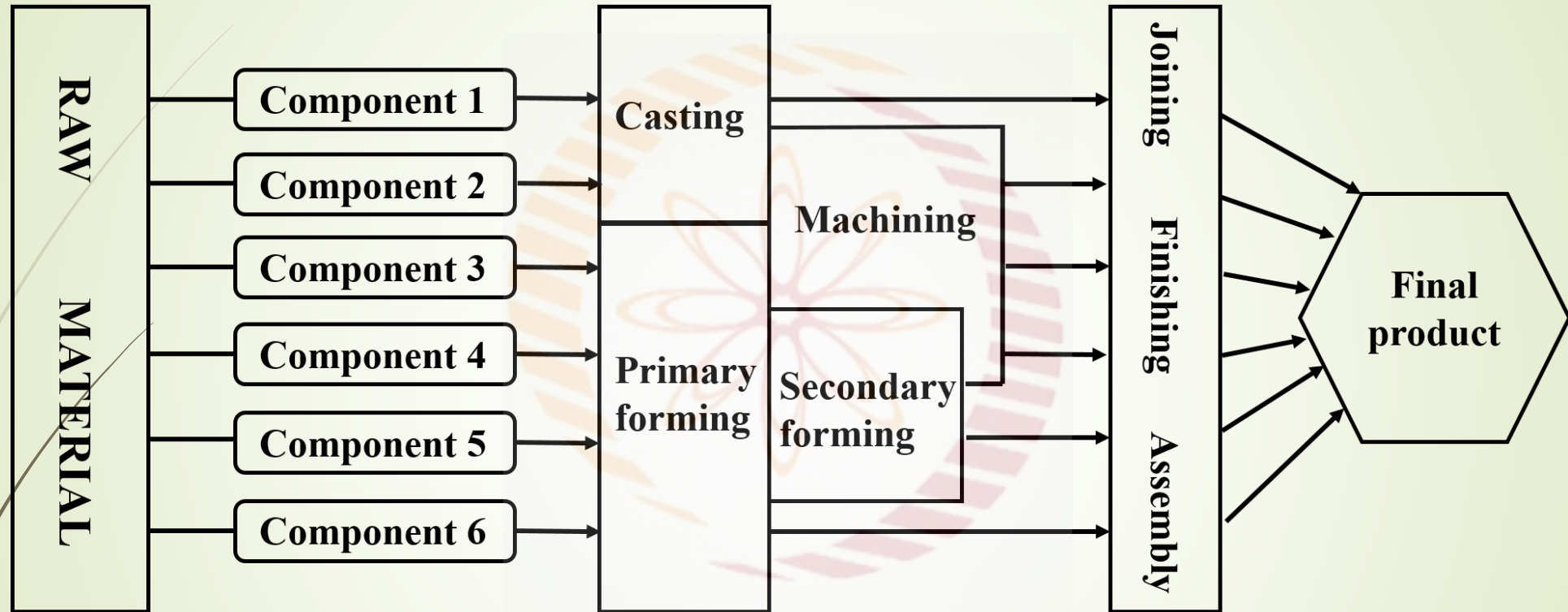
A metal casting is a shape obtained by pouring liquid metal into a mold or cavity and allowing it to freeze and thus take the form of the mold.

Often, the fastest and most economical method for making parts with desired compositions and properties

Almost everything that can be melted, is cast



Manufacturing Operation



Manufacturing Processes



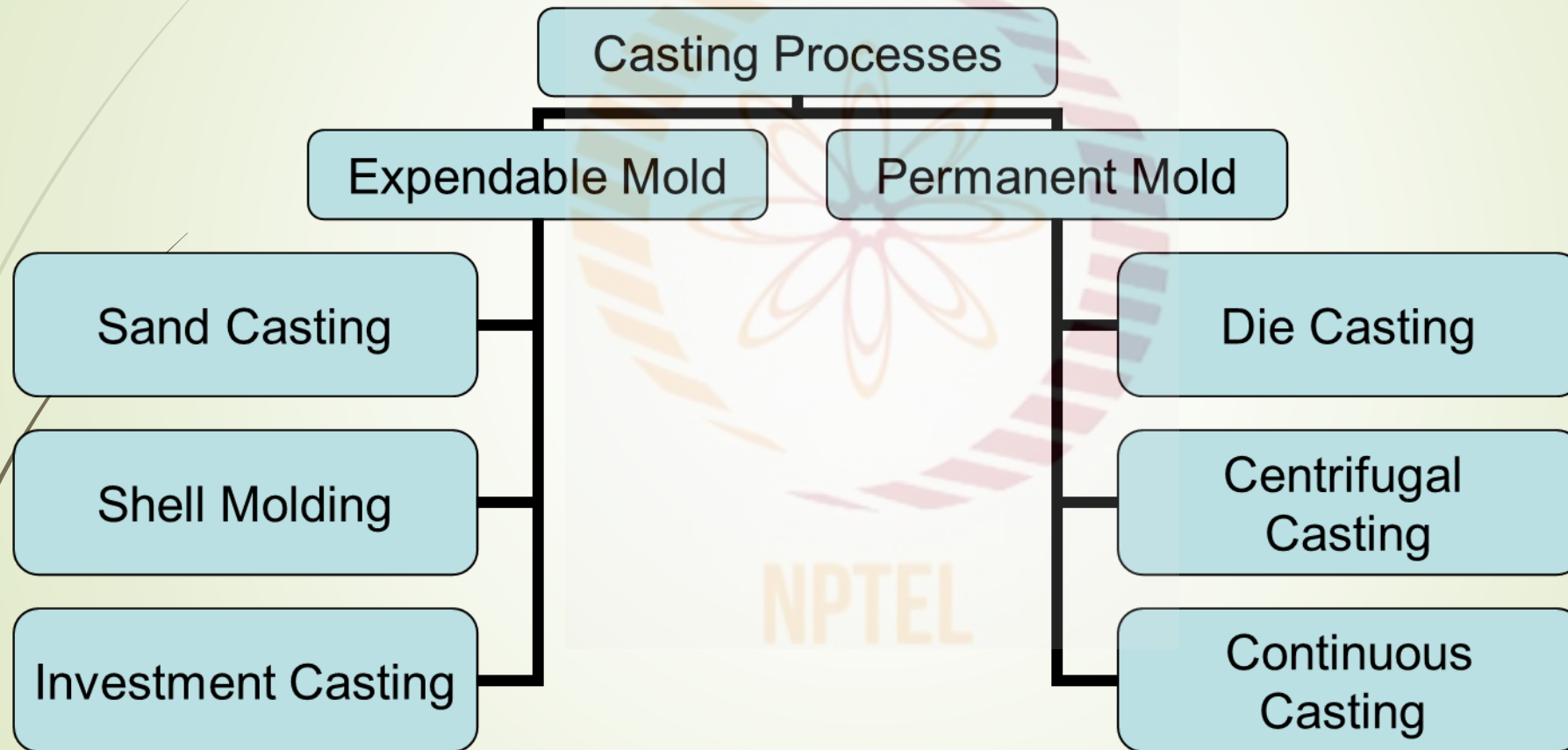
Classification of Casting Processes

Modern industrial castings are produced by a wide variety of processes, processes which are broadly defined in terms of the following:

1. The type of mold material (sand, permanent, etc.)
2. The manner in which the molten metal is introduced into the cavity (gravity, pressure, vacuum)
3. The state of the metal (percent which is liquid)
4. The state of the mold cavity itself (air, vacuum, gas)



Classification of Casting Processes



Casting Processes, Mold and Metal Details

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Casting Processes	I. Mold Material	II. Manner of Entry	III. State of Metal	IV. State of Mold Cavity
Sand Casting	Sand(Bonded with clay and water or chemicals)	Gravity	100% Liquid	Air
Permanent Mold	Metal	Gravity	100% Liquid	Air
Die Casting	Metal	Pressure	100% Liquid	Air
Investment	Ceramic	Gravity	100% Liquid	Air, Vacuum, Gas
Lost Foam EPC	Sand (Unbonded)	Gravity	100% Liquid	Styrofoam, PMMA
Thixocasting Rheocasting	Metal	Pressure	>50% Liquid Balance Solid	Air
Cosworth	Sand	Vacuum	100% Liquid	Air
V Process	Sand(Unbonded with Vacuum and Enclosing Plastic Film)	Gravity	100% Liquid	Air
Centrifugal	Metal, Graphite	Centrifugal Forces	100% Liquid	Air, Gas Shroud
Ingot - NOT Cast to Shape	Metal or electro-magnetic Field	Gravity	100% Liquid	Air or Gas Shroud



Advantages and disadvantages of Casting

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ADVANTAGES:

- Casting can be used to create complex part geometries, including both external and internal shapes.
- Some casting processes are capable of producing parts to net shape. Other casting processes are near net shape, for which some additional shape processing is required (usually machining) in order to achieve accurate dimensions and details.
- Casting can be used to produce very large parts. Castings weighing more than 100 tons have been made.
- The casting process can be performed on any metal that can be heated to the liquid state.
- Some casting methods are quite suited to mass production.