

Unit I

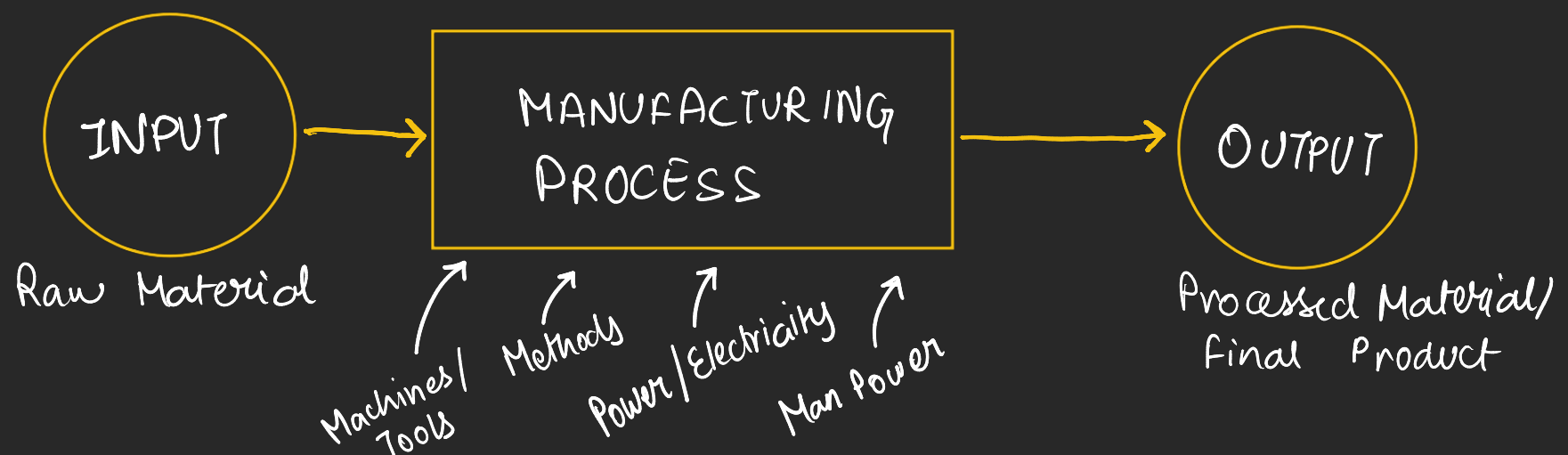
~~Definition of manufacturing, Importance of manufacturing towards technological and social economic development, Classification of manufacturing processes, Properties of materials.~~

Metal Casting Processes: Sand casting, Sand moulds, Type of patterns, Pattern materials, Pattern allowances, Types of Moulding sand and their Properties, Core making, Elements of gating system. Description and operation of cupola.

Working principle of Special casting processes - Shell casting, Pressure die casting, Centrifugal casting. Casting defects. [10Hrs]

MANUFACTURING PROCESS

* The process of producing the desired object from raw materials → Manufacturing Process



IMPORTANCE OF MANUFACTURING

- Manufacturing & Technology are complimentary to each other. Growth in manufacturing increase availability of finished goods and its appliances in various sector.
- Growth of manufacturing → Technological Growth of the country.
- Manufacturing is the backbone of development. Reduces agricultural dependence.
- Increase in manufacturing leads to more exports
↳ Brings in foreign currency.
- Eradicates unemployment & poverty; reduces regional disparity.
- Converting Raw Materials → Finished Products makes country more prosperous [technological advancements]
- Advancement in technology → Increases agricultural output; better tools → more efficient.

CLASSIFICATION OF MANUFACTURING PROCESSES

PRIMARY SHAPING PROCESS

- ↳ CASTING
- ↳ FORGING
- ↳ SMITHY
- ↳ DRAWING
- ↳ ROLLING
- ↳ BENDING

SECONDARY SHAPING PROCESS

- ↳ MACHINING
- ↳ JOINING
- ↳ SURFACE FINISHING

CASTING: Process in which molten metal is poured into a mould, which contains a hollow cavity of the desired shape, and then is allowed to solidify.

FORGING: Solid state manufacturing process. Metal is beaten at a high temperature with a hammer to give the desired shape.

SMITHY: Production of small objects from raw material by heating the material in open furnace.

ROLLING: Reducing the thickness of parts by passing it between the rollers.

BENDING: Deformation of metal in both tension and compression at values below its ultimate strength.

MACHINING: Removal of additional unwanted material in the form of chips by a harder tool in order to attain desired shape from blank material.

JOINING: Joining two or metal parts temporarily or permanently.

SURFACE FINISHING: Used to provide a good surface finish to the metal part w/ the help of polishing, electroplating, painting, etc.

[MECHANICAL] PROPERTIES OF MATERIALS

Define the behaviour of materials under the action of external loads or forces.

STRENGTH: Ability of a material to sustain loads without distortion.

ELASTICITY: Is the disappearance of deformation caused by the application of load; after its removal.

Elastic Limit: Greatest load that a material can withstand without some permanent distortion.

PLASTICITY: Opposite of elasticity.

RIGIDITY: Ability of a material to resist change in its shape or size.

MALLEABILITY: Withstand deformation under compression for drawing out sheets without rupturing.

DUCTILITY

BRITTLINESS → Fracture w/o much deformation

TOUGHNESS → Ability of a metal to withstand bending w/o fracturing.

HARDNESS → Resistance of material to penetration/indentation/scratches.

RESILIENCE : Ability of the material to absorb energy within an elastic limit.

MACHINABILITY : Signifies the amount of force and power required for removing stock from a material.

CREEP : Slow plastic deformation of metal under constant stress (and generally high temperature)

FATIGUE : Phenomenon that causes a metal to fracture under repeated or steady loads.

FORMABILITY : Ease of forming (pressing) a metal into various shapes and sizes.

CASTING

- A process in which liquid material (molten metal) is usually poured into a mould which contains a hollow cavity of the desired shape, and then allowed to solidify.
 - The solidified part is also known as casting (final desired product) which is ejected or broken out of the mould to complete the process.
- ∴ Casting is both a process & a product. [Q]

STEPS IN PREPARATION OF CASTING

PATTERN MAKING :

- Almost the exact replica of final product.
- Used to form an impression (mould) in the sand.
- Shrinkage, machining, distortion allowances are provided.
- Core prints are provided to make core seat in damp sand.

MOULDING SAND PREPARATION :

Process Overview :-

