Manufacturing processes

Lecture one

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Manufacturing processes

The word manufacture is derived from two Latin words manus (hand) and factus (make); the combination means “made by hand”.

Most modern manufacturing operations are accomplished by mechanized and automated equipment that is supervised by human workers.

Manufacturing is the process of converting raw materials into products by various processes, machinery, and operations, following a well-organized plan for each step.

Manufacturing definition- Technologically

Application of physical and chemical processes to alter the geometry, properties, and/or appearance of a given starting material to make parts or products

- Manufacturing also includes the joining of multiple parts to make assembled products
- Accomplished by a combination of machinery, tools, power, and manual labor.
- Almost always carried out as a sequence of operations

Manufacturing definition – Economically

Transformation of materials into items of greater value by means of one or more processing and/or assembly operations.

Manufacturing adds value to the material by changing its shape or properties, or by combining it with other materials.

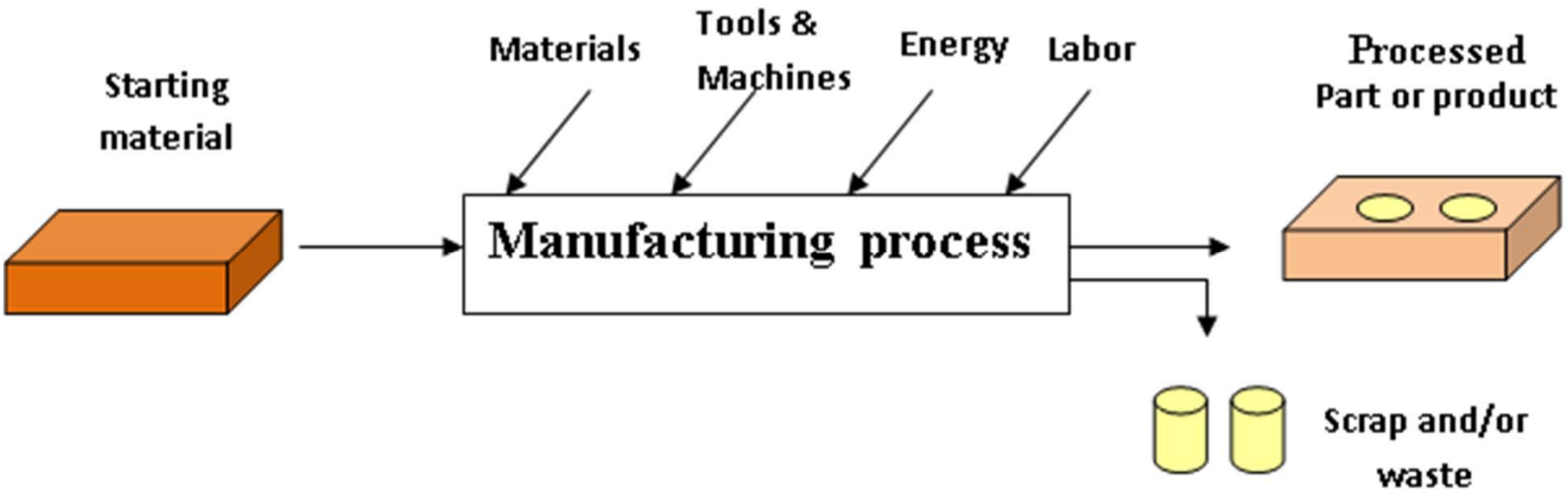

Figure 1.1- Manufacturing as a technical process

Materials used in manufacturing

In general , materials may classified as:

A. Metallic
   - Ferrous
   - Nonferrous

B. Nonmetallic
   - Organic
   - Nonorganic

Manufacturing process that can be used to make products depend on the mechanical and physical properties of the materials.

Most **engineering materials** can be classified into one of three basic categories:

- ***Metals***
- ***Ceramics***
- ***Polymers***
- ***Composites*** Nonhomogeneous mixtures of the other three basic types rather than a unique category.

Metals

Usually used in the form of alloys, which are composed of two or more elements, at least one of which is metallic.

Two basic groups:

1. Ferrous metals - based on iron , the most common (comprises about 75% of metal tonnage in the world):
   - *Steel : Fe-C alloy (0.02 to 2.11% C)*
   - *Cast iron : Fe-C alloy (2% to 4% C)*
2. Nonferrous metals - all other metallic elements and their alloys: aluminum, copper, magnesium, nickel, gold, silver, tin, titanium, etc.

Ceramics

Compounds containing metallic and nonmetallic elements. Typical nonmetallic elements are oxygen, nitrogen, and carbon

For processing, ceramics divide into:

1. Crystalline ceramics – includes:
   - Traditional ceramics, such as clay.
   - Modern ceramics, such as alumina (Al_2O_3).
2. Glasses – mostly based on silica (SiO_2) .