

**Prof. Ing. Dario Pozzetto**

**Department of Engineering and Architecture – University of Trieste**

**Via Valerio, 10 – 34127 Trieste – Tel: 040.558.3805 / 7982 Fax: 040.558.3812**

**E-mail: [pozzetto@units.it](mailto:pozzetto@units.it)**

# **INDUSTRIAL PLANTS**

## **Chapter one:**

### **General information on the industrial plants**

**DOUBLE MASTER DEGREE IN**

***“PRODUCTION ENGINEERING AND MANAGEMENT”***

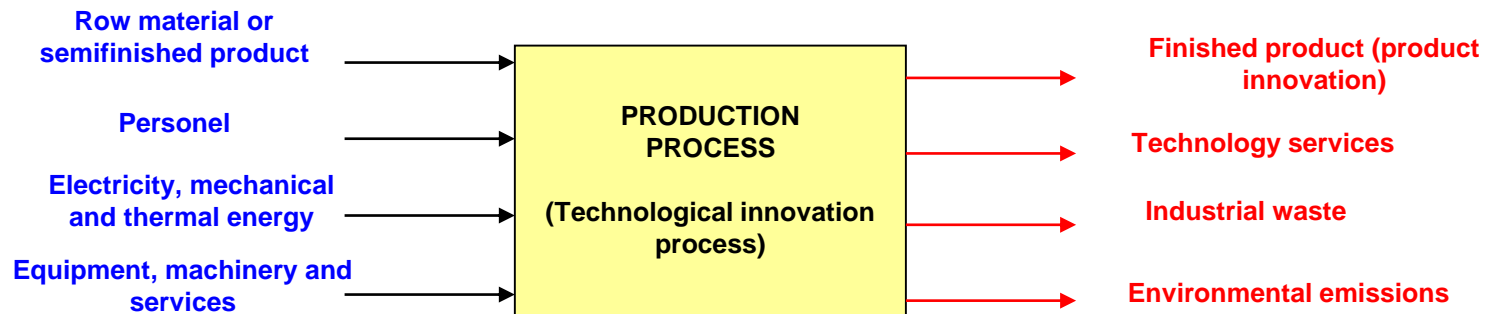
**CAMPUS OF PORDENONE**

**UNIVERSITY OF TRIESTE**

## Generality and definitions

The **industrial plant** or **production system** is a part of a business organization that through a set of durable goods or elements of any kind (machinery, equipment and services), integrated and interacting, which are used as instruments of production, are suitable for treating or transforming materials and energy with the technological processes of any kind or otherwise combined, resulting in finished products of some use, in the fundamental principle of achieving the maximum profit with the minimum average.

The industrial plant is directed to achieving the economic objectives of the strategic business summit, which plan to implement the goods and services higher-value goods or raw materials input is likely to produce a profit.



## Generality and definitions

Within an industrial plant can be distinguished:

a) **“production plants”** or **“technological plants”**

in which operations are performed processing (technological cycle).

These technological plants, however, do not allow to obtain the finished products if they are not fed from the service plants, so much so that they are closely interconnected.

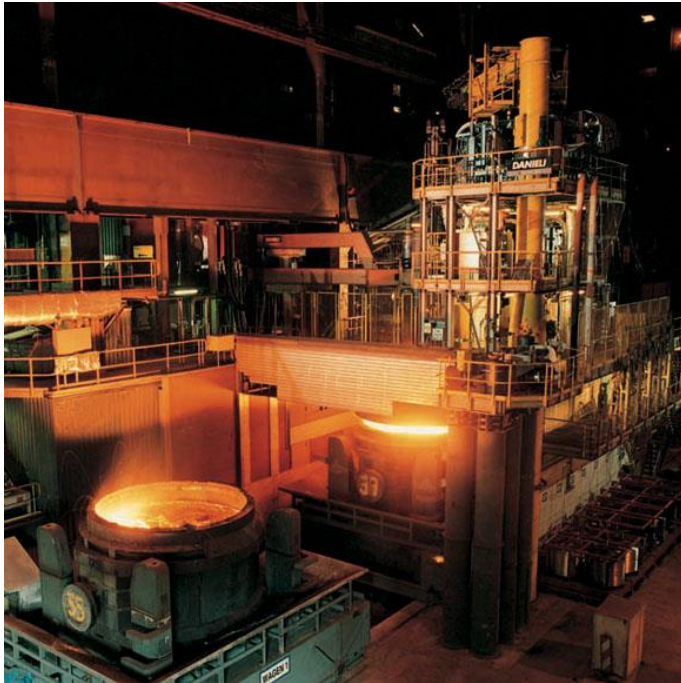
## Generality and definitions

Within an industrial plant can be distinguished:

a) “**production plants**” or “**technological plants**”

The production plants are classified according to:

- ***nature of the transformations and the finished product*** (chemical, electrical, mechanical, steel, wood processing etc.)



## Generality and definitions

Within an industrial plant can be distinguished:

a) “**production plants**” or “**technological plants**”

The production plants are classified according to:

- **size**, as belonging to large, medium and small enterprises (number of employees, production capacity, capital, investments, annual turnover etc.)
- **relations between the two fundamental factors of production** (capital and labor), that lead to capital intensive o labour intensive plants

# Generality and definitions

Within an industrial plant can be distinguished:

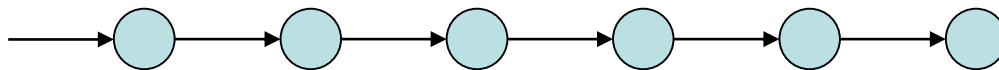
a) “**production plants**” or “**technological plants**”

The production plants are classified according to:

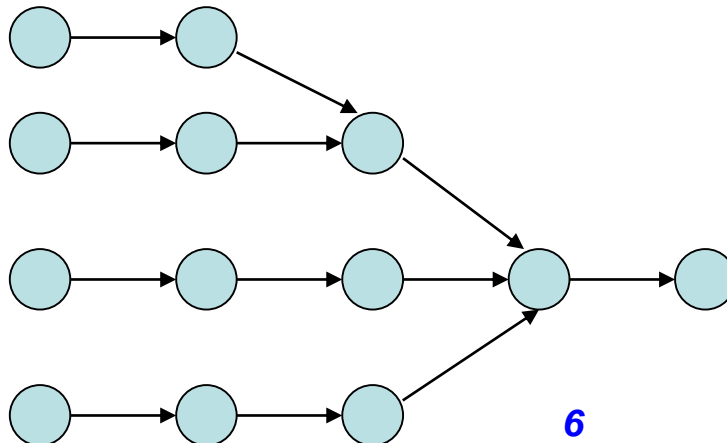
- **technological diagram or production process**

The production processes are divided into:

**monoline** (steel production, paper production, etc.)



**synthetic or converging** (assembly operations)



# Generality and definitions

Within an industrial plant can be distinguished:

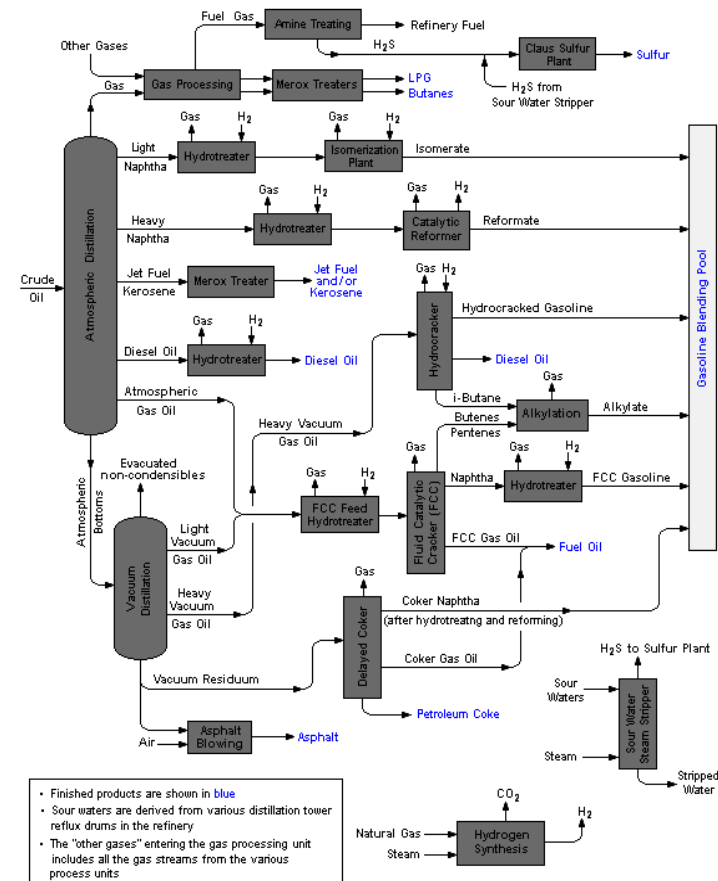
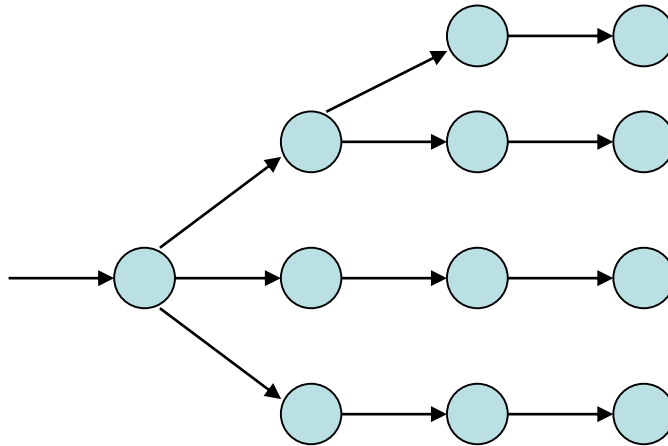
a) **“production plants”** or **“technological plants”**

The production plants are classified according to:

- **technological diagram or production process**

The production processes are divided into:

**analytical or divergent** (oil refinery)



- Finished products are shown in blue
- Sour waters are derived from various distillation tower reflux drums in the refinery
- The “other gases” entering the gas processing unit includes all the gas streams from the various process units

## Generality and definitions

Within an industrial plant can be distinguished:

a) “**production plants**” or “**technological plants**”

The production plants are classified according to:

- ***continuity of the production process***

The production plants are divided into:

- **continuous cycle plants** (paper mill, cement plant, refinery, etc.)
- **intermittent cycle plants** (appliances, furniture-furnishing)





## Generality and definitions

Within an industrial plant can be distinguished:

**b) “auxiliary plants” or “service plants”**

They are complementary plants, placed inside an industrial plant, but not directly involved in the production (generation and supply of thermal energy and/or electrical energy and/or cooling energy, supply and discharge of solid materials or different fluids, etc.)



## Generality and definitions

Within an industrial plant can be distinguished:

### b) “auxiliary plants” or “service plants”

Auxiliary or service plants can be classified into three profiles:

- entity served (plants or people)
- type of service (supply systems or drainage of fluids, etc.)
- function performed (production services, transport services, etc.)

The division into types is very schematic, as it is possible to have interactions:

- service-users connected;
- distribution lines of the service;
- generation system giving rise to the service.

## Generality and definitions

Within an industrial plant can be distinguished:

### b) “auxiliary plants” or “service plants”

The design and implementation of a service is obtained from:

- acquiring the technological expertise needed;
- identifying the characteristics of the loads to be served;
- examination of alternatives for implementing the service and selection;
- choice of solution based on the preliminary design and estimating works;
- qualitative detection of all components of the service;
- size of individual components;
- verification of compliance of the project within the constraints of safety and hygiene;
- standardization of the materials and unification of the size;
- preparation of a detailed design and quantification of costs.

## Generality and definitions

Industrial production can be classified according to:

a) **mode to make that product**

Can be divided into:

- **production for process**

Elements that make up the final product cannot be easily identifiable (steel and cement production)



## Generality and definitions

Industrial production can be classified according to:

a) **mode to make that product**

Can be divided into:

- **production for parts**

It is divided into:

- **manufacturing**, that change shape, size, etc.;
- **mounting**, that make operations assembly parts.



## Generality and definitions

Industrial production can be classified according to:

**b) mode to achieve the production volume**

Can be divided into:

- **production unitary**

The volume of production is relevant to the creation of a single product (shipyard)



## Generality and definitions

Industrial production can be classified according to:

**b) mode to achieve the production volume**

Can be divided into:

- **intermittent production to batch**

The volume of production is carried out in batches over and above the immediate needs (appliances, metal components)



## Generality and definitions

Industrial production can be classified according to:

**b) mode to achieve the production volume**

Can be divided into:

- continuous production

The cycles remain constant for large periods





## Generality and definitions

Industrial production can be classified according to:

c) **mode to respond to market demand**

Can be divided into:

- **production to order**

Activities to be undertaken on the basis of customer orders, is divided into:

- **production to single order** (cruise ship)
- **production to repetitive orders** (furniture)



## Generality and definitions

Industrial production can be classified according to:

c) **mode to respond to market demand**

Can be divided into:

- **production to stock**

The activity is carried out before receiving orders from clients



## Generality and definitions

Industrial production can also be divided into:

**a) *make to stock***

It is the production of standard products before receiving orders from customers, operating on the basis of forecasts (i.e. bolts, bearings, etc.).



The production system is characterized by a rigid production, market risks as the price is fixed at the time of sale and the risk of "life" of the product technology.

## Generality and definitions

Industrial production can also be divided into:

**b) *assembly to order***

It is the production of sub-standard products and subsequent customization of the finished product during final assembly only against an order awarded (such as cars, furniture, etc.)



It is the case of products with high amplitude mix of codes of finished product with some commonality of sub-standard.

The time accepted by the market for order is equal to or slightly greater than the sum of assembly time and the time of delivery.

## Generality and definitions

Industrial production can also be divided into:

c) ***engineer to order***

The production cannot begin until the customer's order has not been acquired. In this case you operate the business of designing, engineering and manufacturing of the product that is typical of the individual committees (i.e. cruise ship)



## Generality and definitions

Industrial production can also be divided into:

**d) *make to order***

A similar, but different, from engineer to order, as has design and engineering can be anticipated prior to the acquisition order of the product that is typical of repetitive orders (i.e. products by catalog)



**PIPELINER**  
Premium Pipe Welding Consumables

## Generality and definitions

Industrial production can also be divided into:

e) ***purchase to order***

We have the components of the product very expensive and therefore can be very expensive to buy without being sure to use them promptly to the call for a customized product. You don't buy materials in advance, but expects the acquisition of the client (the case of craft industries with higher-value products)

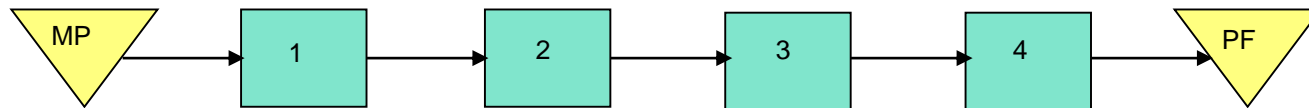
## Generality and definitions

A further classification of the production system can be obtained by considering the product and the process.

Depending on the size of the batch of products and the type of job you can have four different types of production:

**a) *flow shop***

The production process is product-oriented and is characterized by production lots of minor size (flow fragmented product-oriented)





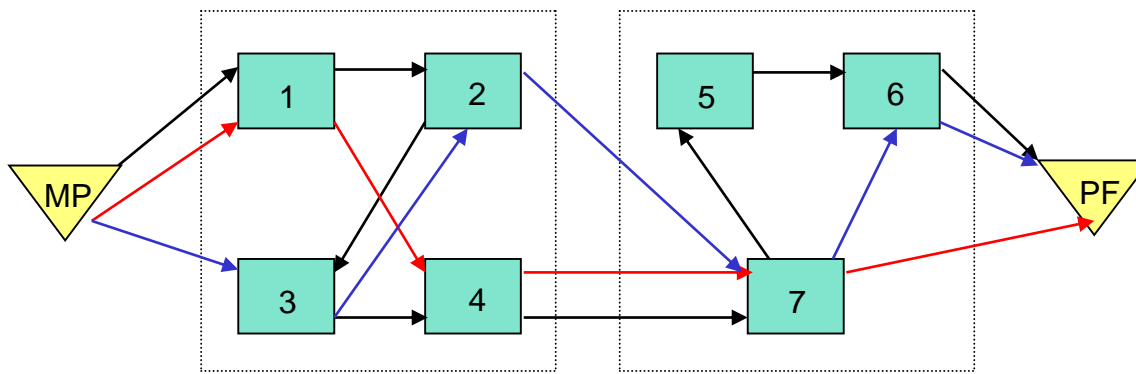
## Generality and definitions

A further classification of the production system can be obtained by considering the product and the process.

Depending on the size of the batch of products and the type of job you can have four different types of production:

### b) *job shop*

The production process is oriented to the function so that plants are grouped and human resources that perform the same function (stamping, turning, welding, finishing). Used for goods on order



## Generality and definitions

A further classification of the production system can be obtained by considering the product and the process.

Depending on the size of the batch of products and the type of job you can have four different types of production:

c) ***batch***

The production process is similar to the job shop, the only difference being that the quantity of products produced are high



## Generality and definitions

A further classification of the production system can be obtained by considering the product and the process.

Depending on the size of the batch of products and the type of job you can have four different types of production:

**d) *continuous***

The production process is similar to the flow shop where the volume of products made are very high. Machining process with a high degree of automation and low flexibility



# Planning and construction of industrial plants

The planning and construction of industrial facilities is divided into:

**a) feasibility study**

defined by the general criteria for selecting and planning an industrial plant. It is divided into the following phases:

- choice, through market research and product design;
- choice of the production cycle of the diagram and definition of working;
- definition of services or auxiliary plants necessary for operation of the production;
- choice of the optimal production capacity based on a comparison of the estimated costs of production and selling prices, and assess the profitability of investment resulting from the construction of industrial

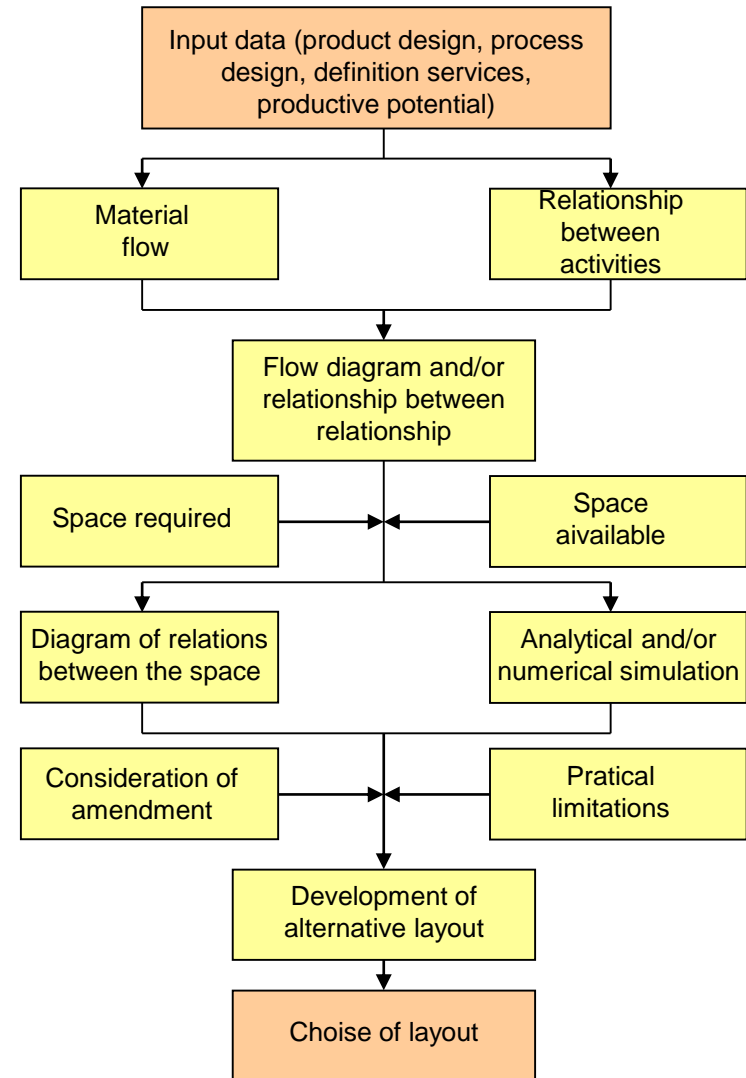
# Planning and construction of industrial plants

The planning and construction of industrial facilities is divided into:

## b) executive design of the industrial

It is divided into the following phases:

- choice of location;
- study of layout (figure);
- project of detailed layout;
- executive design.



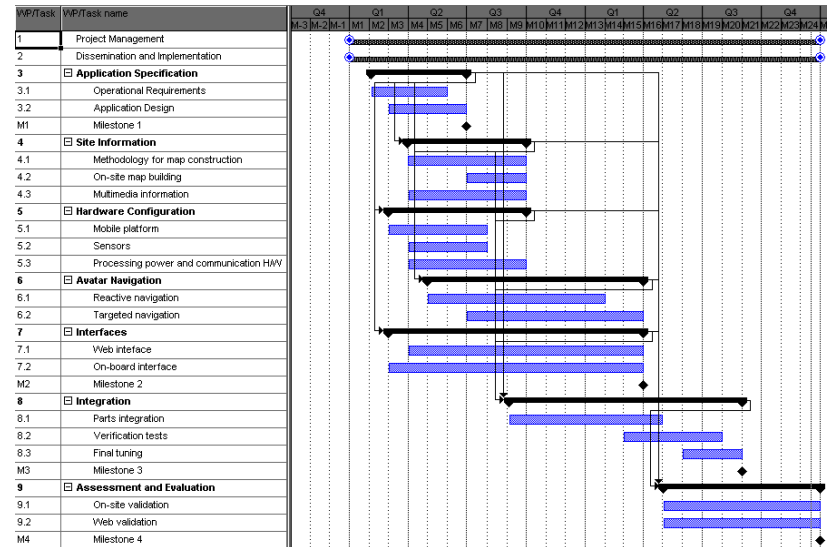
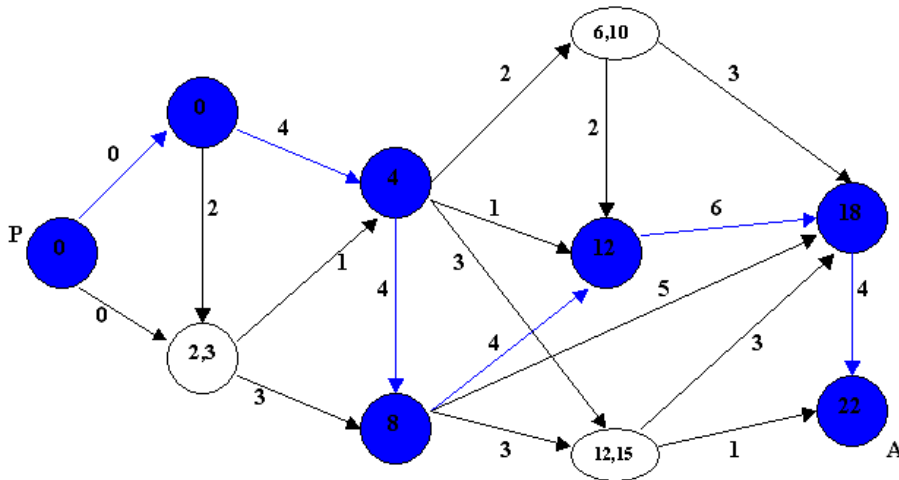
# Planning and construction of industrial plants

The planning and construction of industrial facilities is divided into:

## c) realization of project

It includes:

- times and methods of construction of industrial, which are detectable by the use of reticular techniques (PERT – Project Evaluation Review Technique, Diagram of Gantt etc.);



- development and control of the various phases of realization.

## Planning and construction of industrial plants

The major design, construction and operation of a production plant can be detected in the analysis, selection and definition of the characteristics, methods of implementation and use of common basic elements such as:

- warehouses;
- buildings;
- manufacturing and service machinery;
- materials;
- relative location of jobs and of production and service machines;
- possible future expansion and other changes of same plant;
- security;
- human resources;
- location of plant.