

Production

Production



Industrial production is the set of activities relating to the transformation of raw materials and energy into consumer goods: that is, the combination of production factors (inputs) to make products (outputs).

The transformation procedures may concern:

- forming of material (i.e. melting or sintering); transformation (which may concern, for example, rolling, extrusion, drawing, blanking, laser or plasma cutting, etc.);
- union (i.e. welding, gluing, keying and riveting);
- separation (i.e. milling, planning, reaming, turning, etc.);
- surface treatment;
- modification of physical characteristics (through metallurgy, hardening or tempering).

Assembly work can follow this process if the product is made up of various parts, transformed or added separately.

History of production

- Handcrafted production
- Mass Industrial production
 - batch production
 - In-line Production
 - continuous production
- Production of varieties
 - Lean production
 - Flexible production



Strengths and weaknesses of production types

Production types	Peculiarities	Limits
Handcrafted	Unique product; Craftsman skills	Not standardised
Mass	Increased production volumes; Standardisation of processes and products; Economies of scale	Less details; Inability to distinguish products
Batch	Economies of scale	Very complex and intertwined physical flows
In-line	Lower costs of handling; Simplified control	High Fixed costs for specialized machinery/plant; low flexibility
continuous	Defined materials and continuous flow; High automation and mechanization	Low flexibility; high standardisation

Lean and flexible production

- *Lean production* is created to overcome the instability of demand and the heterogeneity of needs. There is less use of inventory, human resources, investment, fewer hours of planning, etc.;
- *Flexible production* is used to manage business complexity using information technology and new information management systems. It focuses on strategic flexibility and process integration with suppliers and customers, in between production and design and strategy and production. Closely related to lean production is lean management, i.e. the coordination of design, production and quality to obtain a competitive advantage of the company on the market. The person who deals with it is usually the lean manager who manages lean production, rethinking the company's communication flows in order to make them more efficient by eliminating waste and optimizing resources.

Make to stock or make to order: production techniques

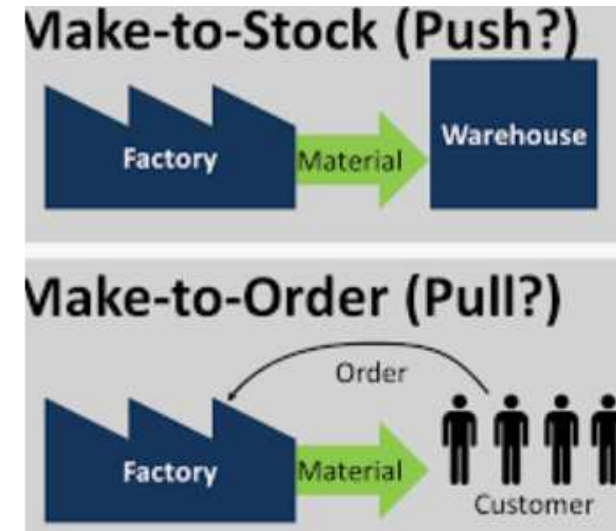
Make to stock

Make to Stock (MTS) is a more common manufacturing technique in which manufacturers produce raw materials on a large scale and put them on store shelves to be sold. Anything that is not sold immediately is stored as inventory. When creating financial statements, inventory is a useful asset consisting of all raw materials, work in progress, and finished goods accumulated by a company. It is often considered the most illiquid of all current assets. When goods are stored for an extended period, they tend to become obsolete or get wasted. Therefore, manufacturing techniques have shifted to Make to Order, especially for industries such as technology, where obsolescence is predominant.



Make to order

- Make to Order (MTO) is a manufacturing technique in which manufacturers begin producing a product only after the customer has placed an order for it. In this case, goods are produced in a customized manner according to the customer's specifications. The MTO production technique is best suited for specialized sectors of industry, such as aircraft manufacturing, construction, etc.
- MTO is also referred to as a "Pull Supply Chain" strategy. A pull supply chain strategy is one in which the entire process of production, assembly and distribution of any goods is driven by actual consumer demand. The production process of goods starts only once an order is received from the customer and the number of units produced also depends on the customer's instructions.



Advantages of using «Make to order» technique

- **1. Waste reduction:** When a stock of goods goes unsold, there is a waste not only of the materials used to produce it, but also of money and labor. Direct labor refers to the wages and salaries paid to workers who are directly involved in producing a specific product or performing a service. In MTO, because products are manufactured after receiving a customer's order and in the specified quantity, waste and losses are minimized.
- **2. Less inefficiency:** When a large variety of goods are produced on a large scale, there is a risk of inefficiency because workers and machines have to follow different rules. In MTO, all efforts are focused on making the product according to customer specifications, so workers and machines tend to be more efficient.
- **3. Greater variety:** Because only custom items are produced and sold, MTO offers a greater variety of products. In fact, it provides customers with the product exactly as they want it to be.

Disadvantages

- **1. Irregular Sales:** It is difficult to determine when demand for a particular custom product may arise. Thus, there may be periods of high sales and months of no sales. For example, demand for military aircraft arises during times of hostile international relations, but such situations cannot be predicted in advance.
- **2. Long delivery time:** Since production starts after receiving an order, the product reaches the customer after some time. Also, because product customization takes time, delivery time may take longer.
- **3. Availability of raw materials:** The uncertainty of demand raises the need to maintain a sufficient supply of raw materials so that production can start immediately after receiving an order. In the event that raw materials are not ready, it takes longer to procure them and deliver the final product to the customer.

Production programming

Production planning establishes how much the company should produce as part of the production process consisting of organizational units in a certain unit of time (month, week, day). The production planning process is divided as follows:

- Annual production plan, consistent with market demands and with the production capacity;
- Scheduling or operational planning, weekly and daily, by which production volumes are set on the basis of updated requests coming from the market;
- The launch of Production;
- The assignment of production orders to production units;
- The request for supply of components and raw materials.

Balance between available production capacity and workload

Linked to annual production plan, consistent with market demands and production capacity

In balancing workload and production capacity, it is important to verify whether each production unit is able to carry out the workload coming from the production program, by analyzing:

- The availability of each production unit in the reference period;
- The workload, also calculated per production unit and per period;
- The total production "lead time", that is the time that elapses from the beginning of the production cycle (acceptance of an order, or launch of an internal production order on the basis of sales forecasts, etc.) to the end of the cycle (deposit of the finished product or packaging in the warehouse, shipments, etc.).

How to calculate the «Lead time»

To understand how long an organization takes to produce an item, it is necessary to add up all the specific times present in the production environment.

We can identify the following macro types of time (although it is then possible to define sub-sets):

- Queue time, it is the time lost by a process while waiting for the machine to free itself from the other previous processes
- Machine set-up time, it is the time it takes to prepare the machine for processing.
- Processing time, it is the time required for the transformation of an item
- Downtime, it is the sum of times in which the machine does not work
- Waiting time, it is the time that a piece needs before being ready for the next phase. Examples include cooling time, drying time, etc.
- Handling time, it is the time taken to transport, store, pick up the item inside the production area

