Production Planning and Control

Introduction

Production function is that part of an organization, which is concerned with the transformation of a range of inputs into the required outputs (products) having the requisite quality level. Production may be understood as "the step-by-step conversion of one form of material into another form through chemical or mechanical process to create or enhance the utility of the product to the user. Thus production is a value addition process.

In any manufacturing enterprise, the main objective of production department is to produce the things in desired quantity at desired time so that they may be made available to end users when they demand it. Production, being a very complex process is very difficult to manage for the people. This includes a large number of activities and operations which need to be planned appropriately and in turn controlled for the effective production of the output. The main purpose of production planning and control (PPC) is to establish routes and schedules for the work that will ensure the optimum utilization of materials, workers, and machines and to provide the means for ensuring the operation of the plant in accordance with these plans.

There are different types of production systems. The choice of production system depends upon the nature of products, variety of products and volume of products. These production systems have been discussed in this chapter in detail. Entrepreneurs, after finalizing the production system to be used are required to go for the production planning and control (PPC) which essentially depends upon the type of production system.

Production planning and control is necessarily concerned with implementing the plans, i.e. the detailed scheduling of jobs, assigning of workloads to machines (and people), the actual flow of work through the system. Production is an organized activity of converting row materials into useful products. Production system requires the optimal utilization of natural resources like men, money, machine, materials and time. Production planning and control coordinate with different departments: such as production, marketing, logistics, warehouse and other departments depending upon the nature of organization. Production planning and control receives data related to orders from marketing departments. Production plan based on marketing and production data is prepared

in production planning and control. This production plan provides clear idea about utilization of manufacturing resources for production. Prepared production plan is delivered to production department. Production department manufacture products according to that plan.

The ultimate objective of production planning and control, like that of all other manufacturing controls, is to contribute to the profits of the enterprise. As with inventory management and control, this is accomplished by keeping the customers satisfied through the meeting of delivery schedules.

The main objectives of PPC may be summarized as followings:-

a) It is used to establish target and check the deviations by comparing on some performance measures.

b) Decides the nature and magnitude of different input factors to produce the output.

c) Coordinates different resources of production system in the most effective and economic manner and to coordinate among different departments.

d) Elimination of bottleneck

e) Utilization of inventory in the optimal way

f) Smooth flow of material

g) To produce in right quantity and quality at right time

h) Scheduling production activities to meet delivery schedule

i) Expediting the system under production

j) To ensure flexibility in production system to accommodate changes and uncertainty

k) Optimizes the use of resources for minimum overall production cost

l) To ensure the production of right product at right time in right quantity with specification rightly suited to customers

m) Stable production system, with least chaos, confusion and undue hurry.

Meaning of Production:

Production refers to the transformation of inputs into finished goods/ or creation of services in order to satisfy the customer needs. This uses different inputs mainly including 6M's namely, man, material, machine, money, method and management. Production involves application of processes by which the inputs can be transformed into desired product (output) of potential utility while improving properties and adding economic values through the best method without compromising on quality.

Different forms of production based on the processes used:

1. Production by extraction or separation: like petrol, kerosene, sugar etc

2. Production by assembly: car, television, furniture

Edwood Buffa defines production as “a process by which goods and services are created” Some examples of production are: manufacturing custom-made products like, boilers with a specific capacity, constructing flats, some structural fabrication works for selected customers etc. At each stage of processing, there will be value addition. It is easy to understand a production system from the figure . There are various inputs which essentially pass through a transformation/ conversion process and finally converted into some outputs which have a value for the end users.

The outputs may be in the form of tangible products or services. In nutshell, production system of an organization is that part, which produces products of an organization. It is that activity whereby resources, flowing within a defined system, are combined and transformed in a controlled manner to add value in accordance with the policies communicated by management. A simplified production system is shown.

Production management involves the managerial decisions regarding design of the product and design of the production system i.e. determination of production processes and production planning and control.

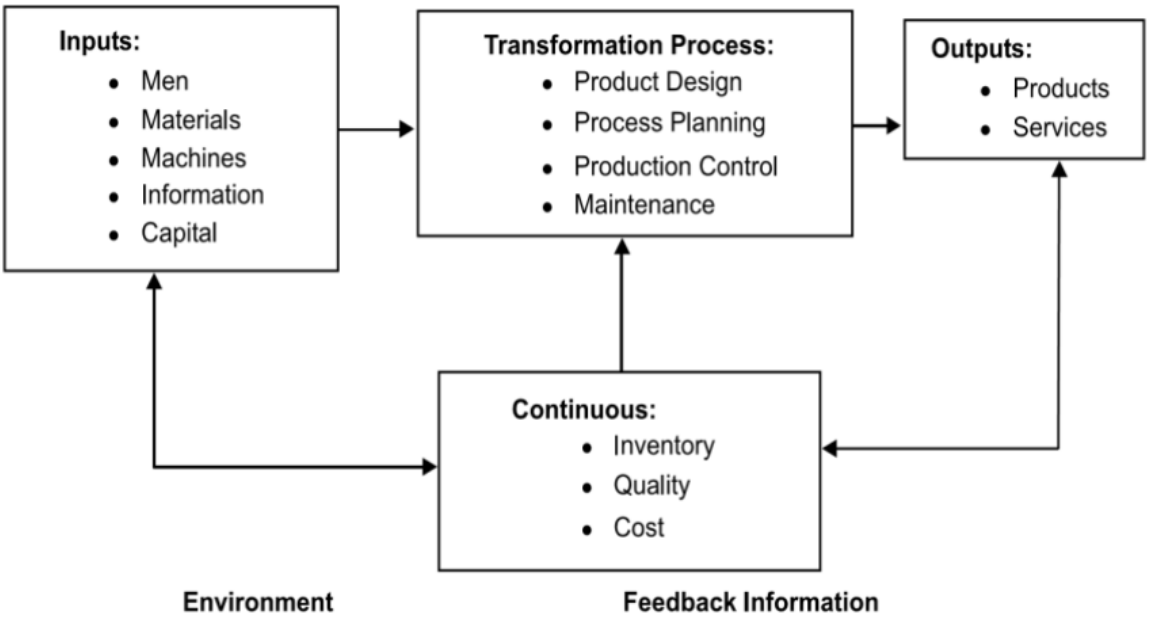


Fig. 1.1 *Schematic production system*

Types of Production systems :

There are mainly three types of production systems mentioned as below:

(1) Continuous/Mass production

(2) Job or unit production

(3) Intermittent/Batch production

(1) Continuous/Mass production: It is used when we need to produce standardized products with a standard set of process and operation sequence in anticipation of demand. This ensures continuous production of output. It is also termed as mass flow production or assembly line production. This system results in less work in process (wip) inventory and high product quality but involves high capital investment in machinery and equipment. This ensures very high rate of production as we need not to intervene once the production has begun. The system is appropriate in plants where large volume of small variety of output is produced. e.g. oil refineries, cement manufacturing and sugar factory etc.

Characteristics of Continuous/Mass production:

a) As same product is manufactured for sufficiently long time, machines can be laid down in order of processing sequence.

b) Standard methods and machines are used during part manufacture.

c) Most of the equipment's are semi automatic or automatic in nature.

d) Material handling is also automatic (such as conveyors).

e) Semi-skilled workers are normally employed as most of the facilities are automatic.

f) As product flows along a pre-defined line, planning and control of the system is much easier.

g) Cost of production per unit is very low owing to the high rate of production.

h) In process inventories are low as production scheduling is simple and can be implemented with ease.

(2) Job or Unit production: It involves production as per customer's specifications. This

ensures the simultaneous production of large number of batches/orders. Each batch or order comprises of a small lot of identical products and is different from other batches. It requires comparatively smaller investment in machines and equipment. It is flexible and can be adapted to changes in product design and order size without much inconvenience. This system is most suitable where heterogeneous products are produced against specific orders. In this system products are made to satisfy a specific order. However that order may be produced- only once or at irregular time intervals as and when new order arrives or at regular time intervals to satisfy a continuous demand.

Characteristics of Job or Unit Production:

a) Machines and methods employed should be general purpose as product changes are quite frequent.

b) Man power should be skilled enough to deal with changing work conditions.

c) Schedules are actually nonexistent in this system as no definite data is available on the product. In process inventory will usually be high as accurate plans and schedules do not exist.

d) Product cost is normally high because of high material and labor costs.

e) Grouping of machines is done on functional basis (i.e. as lathe section, milling section etc.) This system is very flexible as management has to manufacture varying product types. Material handling systems are also flexible to meet changing product requirements.

(3) Intermittent/Batch Production: This is concerned with the production of different types of products in small quantities usually termed as batches. A batch contains the similar products but in small quantity. This is used to meet a specific order or to meet a continuous demand. Batch can be manufactured either- only once or repeatedly at irregular time intervals as and when demand arise or repeatedly at regular time intervals to satisfy a continuous demand. Under this system the goods may be produced partly for inventory and partly for customer's orders. For example, components are made for inventory but they are combined differently for different customers. e.g. automobile plants, printing presses, electrical goods plant are examples of this type of manufacturing.

Characteristics of Intermittent/ Batch Production:

a) As final product is somewhat standard and manufactured in batches, economy of scale can be availed to some extent.

b) Machines are grouped on functional basis similar to the job shop manufacturing.

c) Semi-automatic, special purpose automatic machines are generally used to take advantage of the similarity among the products.

d) Labor should be skilled enough to work upon different product batches.

e) In process inventory is usually high owing to the type of layout and material handling policies adopted.

f) Semi-automatic material handling systems are most appropriate in conjunction with the semi-automatic machines.

Meaning of Production Planning and Control:

PPC is a very critical decision which is necessarily required to ensure an efficient and economical production. Planned production is an important feature of any manufacturing industry. Production planning and control (PPC) is a tool to coordinate and integrate the entire manufacturing activities in a production system. This essentially comprises of planning production before actual production activities start and then exercising control over those activities sto ensure that the planned production is realized in terms of quantity, quality, delivery schedule and cost of production.

According to Gorden and Carson, PPC usually involve the organization and planning of manufacturing process. Principally, it includes entire organization. The various activities involved in production planning are designing the product, determining the equipment and capacity requirement, designing the layout of physical facilities and material and material handling system, determining the sequence of operations and the nature of the operations to be performed along with time requirements and specifying certain production and quantity and quality levels.

Production planning also includes the plans of routing, scheduling, dispatching inspection, and coordination, control of materials, methods machines, tools and operating times. Its ultimate objective is the to plan and control the supply and

movement of materials and labour, machines utilization and related activities, in order to bring about the desired manufacturing results in terms of quality, quantity, time and place. This provides a physical system together with a set of operating guidelines for efficient conversion of raw materials, human skills and other inputs to finished product.

Procedure of Production Planning and Control:

The PPC is entirely based on the pre-design format. It attempts to execute and implement all activities/operations according to the set plan. All operations should be executed in a proper manner with a close vigil on all facts ensuring that the time period and the stipulated costs should not go beyond the reach and it should be done under the excepted/agreed policies. These costs are including the cost of assets, capital cost of the facility, and labour. The PPC consists of the following steps.

a) Forecasting the demands of the customers for the products and services.

b) In advance preparing the production budget.

c) Design the facility layout.

d) Specify the types of machines and equipment.

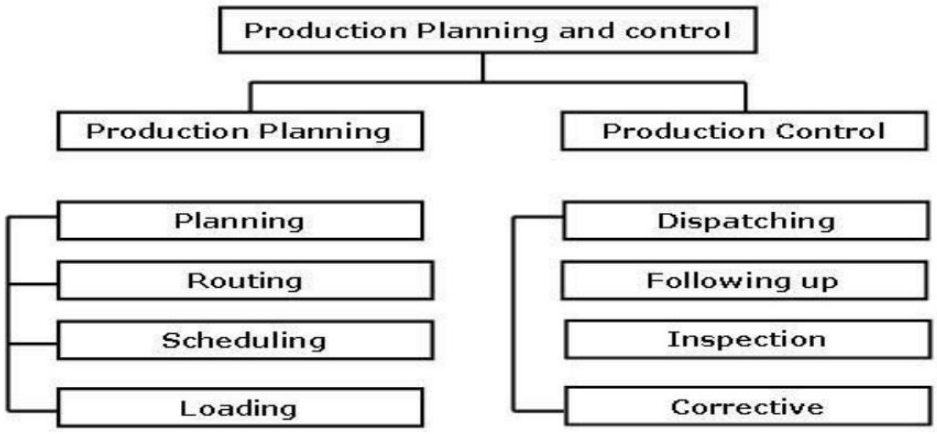
e) Appropriate production requirements of the raw materials, labour, and machinery.

f) Drawing the apt schedule of the production.

g) Confirming the shortage or any excess of the end product.

h) Future plans are drawn for any sudden surge in the demand for the product.

Some important elements of PPC have been depicted in the figure as below:



The important elements may be listed as following:

1. Materials: planning for procurement of raw material, component and spare parts in the right quantities and specifications at the right time from the right source at the right place. Purchasing, storage, inventory control, standardization, variety reduction, value analysis and inspection are the other activities associated with material.
2. Method: choosing the best method of processing form several alternatives. It also includes determining the best sequence of operations (process plan) and planning for tooling, jigs and fixtures etc
3. Machines and equipment: manufacturing methods are related to production facilities available in production systems. It involves facilities planning, capacity planning, allocations, and utilization of plant and equipment, machines etc.
4. Manpower: planning for manpower (labour and managerial levels) having appropriate skills and expertise.
5. Routing; determining the flow of work material handling in the plant, and sequence of operations or processing steps. This is related to consideration of appropriate shop layout plant layout, temporary storage location for raw materials, component and semi-finished goods, and of materials handling system
6. Estimating: Establishing operation times leading to fixations of performance standards both for worker and machines. Estimating involves deciding the quantity of the product which needs to be produced and cost involved in it on the basis of sale forecast.

Estimating manpower, machine capacity and material required meeting the planned production targets are like the key activities before budgeting for resources.

7. Loading: machine loading is the process of converting operation schedule into practices in conjunctions with routing. Machine loading is the process assigning specific jobs to machines, men, or work centers based on relative priorities and capacity utilization. Loading ensures maximum possible utilization of productive facilities and avoid bottleneck in production. It’s important to either overloading or under loading the facilities, work centers or machines to ensure maximum utilization

of resources.

8. Scheduling: scheduling ensure that parts and sub-assemblies and finished goods are completed as per required delivery dates. It provides a timetable for manufacturing activities.

9. Dispatching: This is concerned with the execution of the planning functions. It gives necessary authority to start a particular work which has already planned under routing and scheduling functions. Dispatching is release of orders and instructions for starting of production in accordance with routing sheet and scheduling charts.

10. Inspection: This function is related to maintenance of quality in production and of evaluating the efficiency of the processes, methods and labours so that improvement can be made to achieve the quality standard set by product design.

11. Evaluating: The objective of evaluating is to improve performance. Performance of machines, processes and labour is evaluated to improve the same.

12. Cost control: Manufacturing cost is controlled by wastage reduction, value analysis, inventory control and efficient utilization of all resources.

Requirements for an effective Production Planning and Control:

In an organization, PPC system can be effective only if the following aspects are given due considerations before implementation:

a) Appropriate organization structure with sufficient delegation of authority and responsibility at various levels of manpower.

b) Right person should be deputed at right place for right job.

c) Maximum level of standardization of inventory, tooling, manpower, job, workmanship, equipment, etc.

d) Appropriate management decision for production schedule, materials controls, inventory and manpower turnover and product mix.

e) Flexible production system to adjust any changes in demand, any problem in production or availability of materials maintenance requirements, etc

f) Estimation of accurate leads times for both manufacturing and purchase.

g) Management information system should be reliable, efficient and supporting.

h) Capacity to produce should be sufficient to meet the demand.

i) The facility should be responsive enough to produce new products change of products

mix and be able to change the production rates.

References :

a) Rama Murthy, P., Production and Operations Management, New Age International Publishers, 2005

b) Chase, R.B., Aquilano, N.J., and Jacobs, F.R., Production and Operations Management: Manufacturing and Services, Richard D. Irwin, Inc., 1998.

c) Narshimha, S.L., Production Planning and Inventory Control, PHI, 2002

d) Garg, A.K., Production and Operations Management, Mc GrawHill, 2012

e) Chary, S.N., Operations Management, TMH, 1996

f) Baffa and Sarin, R., Modern Production/ Operations Management, John wiley and Sons,2002