C P PATEL AND F H SHAH COMMERCE COLLEGE, ANAND

NILAM PARMAR [NP]

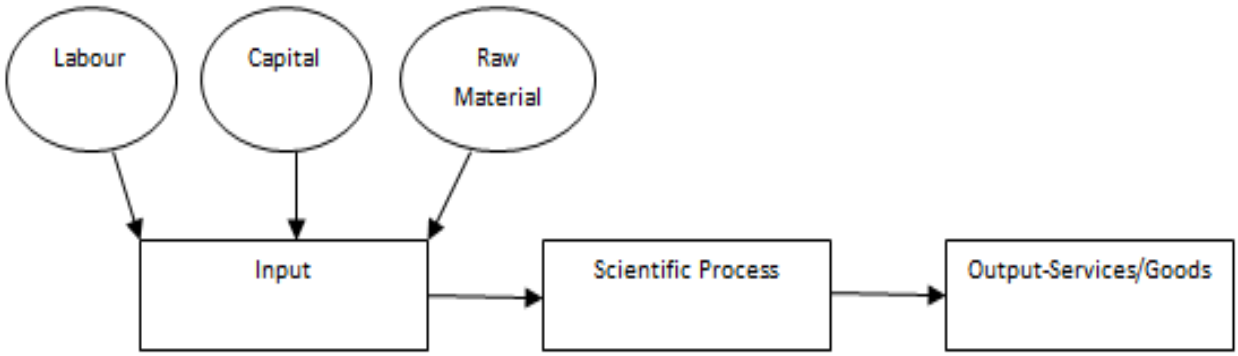
Materials and Production Management

Unit 3 Introduction to Production Management

- **Meaning and Definition of Production Management**
- **Scope and Importance of Production Management**
- **Role of Production Managers**
- **Types of Production Process (Job, Lot, Batch and Mass Production)**

MEANING OF PRODUCTION

Production is an intentional act of producing something in an organized manner. It is the fabrication of a physical object through he use of men, material and some function which has some utility e.g. repair of an automobile, legal advice to a client, banks, hotels, transport companies etc.
Thus irrespective of the nature of organization, production is some act of transformation, i.e. inputs are processed and transformed into some output.
The main inputs are information, management, material, land, labour and capital.
Fig. shown below explains the production process of an organization.



Meaning of Production Management

Production management is a branch of management which is related to the production function. Production may be referred to as the process concerned with the conversion inputs (raw materials, machinery, information, manpower, and other factors of production) into output (semi finished and finished goods and services) with the help of certain processes (planning, scheduling and controlling etc.)
While management is the process of exploitation of these factors of production in order to achieve the desired results. Thus production management is the management which by scientific planning and regulation sets into motion the part of an enterprise to which it has been entrusted the task of actual transformation of inputs into output. A few definitions of production management are being reproduced hereunder to understand the meaning of the term clearly:

(i) "Production management then becomes the process of effectively planning and regulating the operations of that part of an enterprise which is responsible for actual transformation of materials into finished products"

The definition seems to be quite incomplete as it ignores the human factors involved in a production process and lays stress only on the materialistic features.
Elwood S. Buffa has defined the term in a broader sense as :

(ii) "Production management deals with decision making related to production process so that the resulting goods or services are produced according to specifications in amounts and by the schedules demanded, and at a minimum cost".
Thus production management is concerned with the decision making regarding the production of goods and services at a minimum cost according to the demands of the customers through the management process of planning, organizing and controlling. In order to attain these objectives, effective planning and control of production activities is very essential. Otherwise, the customers shall remain unsatisfied and ultimately certain-activities may have to be closed. Production management, thus, is assigned with the following tasks –

(i) Specifying and accumulating the input resources, i.e., management, men, information, materials, machine and capital.
(ii) Designing and installing the assembly or conversion process to transform the inputs into output, and
(iii) Coordinating and operating the production process so that the desired goods and services may be produced efficiently and at a minimum cost.

SCOPE OF PRODUCTION MANAGEMENT

Production management is mainly associated with the factory management crept with the development of factory system. Before the evolution of factory system, manufacturing activities were carried on by single person that posed no or very insignificant problem of production and therefore question of production management did not arise. But with the inception of factory system, the situation changed and so many problems of production were begun to creep up and necessity arose to tackle with the problems of quality control, layout facilities, meeting the schedules and organization of production activities. Thus the scope of production management began to develop. In early stage, the stress was on controlling the labour costs because labour cost was the major element of the total cost of production. With the continuing development of factory system, the trend towards mechanization and automation developed and it resulted in the increased costs of indirect labour higher than the direct labour costs. So concerns found it difficult to run the business in these circumstances and evolved many controlling devices to regulate the cost of production. They had developed devices like designing and packing of products, indirect labour cost control, production & inventory control and quality control.

Since the level of production has increased tremendously, so many other production problems have been added to its scope. In the present era of intense competition, the scope of production management is very wide. The production department in an enterprise is not only concerned with the full exploitation of production facilities but also the human factor that indirectly affects the production, utilization of latest techniques of production and the production of quality goods to the satisfaction of customers of the product.
The various activities that form scope of production function can be studied in the following broad areas –

1. Product Selection and Design: The product mix makes the production system either efficient or inefficient. Choosing the right products, keeping the mission and overall objectives of the organization in mind is the key to success. Design of the product, which gives it enough functional and aesthetic value, is of paramount importance. It is the design of the product which makes the organization competitive or non competitive. Value engineering does help to retain enough features, while eliminating the unnecessary ones.

2. Activities Relating to Production System Designing: Decision related to the production system design is one of the most important activity of the production management. This activity is related to production engineering and includes problems regarding design of tools and jigs, the design, development and installation of equipment and the selection of the optimum size of the firm. All these areas require the technical expertise on the part of the production manager and his staff.

3. Facilities Location: The selection of an optimum plant location very much depends upon the decision taken regarding production engineering. A wrong decision may prove disastrous. Location should as far as possible cut down the production and distribution cost. There are diverse factors to be considered for selecting the location of a plant.

4. Method Study: The next decision regarding production system design concerns the use of those techniques which are concerned with work environment and work measurement. Standard methods should be devised for performing the repetitive functions efficiently. Unnecessary movements should be eliminated and suitable positioning of the workers for different processes should be developed. Such methods should be devised with the help of time study and motion study. The workers should be trained accordingly.

5. Facilities Layout and Materials Handling: Plant layout deals with the arrangements of machines and plant facilities. The machines should be so arranged that the flow of production remains smooth. There should not be

overlapping, duplication or interruption in production flow. Product layout, where machines are arranged in a sequence required for the processing of a particular product, and process layout, where machines performing the similar processes are grouped together are two popular methods of layout. The departments are laid out in such a way that the cost of material handling is reduced. There should be proper choice of materials handling equipment. These days, computer software is available for planning the process layout (e.g. CRAFT, CORELAP etc.). Group Technology (G.T.), Cellular Manufacturing Systems (CMS) and Flexible Manufacturing Systems (FMS) have made our concepts of layout planning undergo a tremendous change.

6. Capacity Planning: This deals with the procurement of productive resources. Capacity refers to a level of output of the conversion process over a period of time. Full capacity indicates maximum level of output. Capacity is planned for short-term as well as for long term. Process industries pose challenging problems in capacity planning, requiring in the long run, expansion and contraction of major facilities in the conversion process. Some tools that help us in capacity planning are marginal costing (Break Even Analysis), learning curves, linear programming, and decision trees.

7. Production Planning: The decisions in production planning include preparation of short-term production schedules, plan for maintaining the records of raw materials, finished and semi-finished stock, specifying how the production resources of the concern are to be employed over some future time in response to the predicted demand for products and services. Production planning takes a given product or line of products and organizes in advance the manpower, materials, machines and money required for a predetermined output in a given period of time.
Thus, production planning is a management technique which attempts to gain the best utilization of a firm's manufacturing facilities. It is gained by the integration and coordination of the manpower, machines, materials and plant services employed in the manufacturing cycle.

8. Production control: After planning, the next managerial production function is to control the production according to the production plans because production plans cannot be activated unless they are properly guided and controlled. For this purpose, production manager has to regulate work assignment, review work process, check and remove discrepancies, if any, in the actual and planned performances.
According to Soriegel and Lansburgh "Production control is the process of planning production in advance of operations; establishing the exact route of each individual item, part or assembly; setting, starting and finishing dates for each important item, assembly and the finished products; and releasing the

necessary orders as well as initiating the required follow-up to effect the smooth functioning of the enterprise". Thus production control involves the following stages:
(i) Planning — setting targets of production.
(ii) Routing — to decide the route or flow-of production activity.
(iii) Dispatching — to issue materials and authorizations for the use of machines and plant services.
(iv)Follow-up — it compares the actual production with the targeted production. Deviations are found out and corrected and reasons are investigated.

9. Inventory Control: Inventory control deals with the control over raw materials, work-in-progress, finished products, stores, supplies, tools, and so is included in production management.
The raw materials, supplies etc. should be purchased at right time, of right quality, in right quantity, from right source and at right price. This five 'R's consideration enables the scientific purchases.
Store-keeping is also an important aspect of inventory control. The raw materials, work-in-progress, finished goods, supplies, tools etc. should be stored efficiently. The different levels of inventory should be managed properly and the issue of materials to departments should be made promptly and effectively. Proper records should also be kept for various items of inventory control.
The production manager has to look after the inventory control activities at three levels –
(i) Control of inventories such as raw materials, purchased parts, finished goods and supplies through the inventory control technique;
(ii) Control of flow of materials into the plants through the technique of judicious purchasing;
(iii) Control of work-in-progress through production control.

10. Quality control: The other important decision taken by the production manager concerns quality control. Product quality refers to the composite product characteristics of engineering and manufacturing that determines the degree to which the product in use will meet the expectations of the customers. Quality control can be ensured through the techniques of inspection and statistical quality control.

11. Maintenance and Replacement: In this we cover preventive methods to avoid machine break-downs, maintenance, policies regarding repair and replacement decisions. Maintenance manpower is to be scheduled and repair jobs are to be sequenced. There are some preventive replacements also. Machine condition is to be constantly monitored. Effective maintenance is a crucial problem for India which can help better capacity utilization and make operations systems productive enough.

12. Cost Reduction and control: Cost reduction ultimately improves productivity. The industry becomes competitive. Essentially cost reduction and cost elimination are productivity techniques. Value engineering, budgetary control, standard costing, cost control of labour and materials etc. help to keep costs optimal.

All Production decisions are subject to control measures, after receiving proper feed-back. Control function is exercised over the quantity to be produced, quality expected, time needed, inventory consumed & carried and costs incurred. Control system is designed after due cost benefit analysis. Controls should be selective. A self-controlling cybernetic system though preferable is not possible in all complex industries.

Environmental changes ultimately affect all the systems of the organization. A dynamic environment makes it compulsory to adapt the production system to the changes in technology and other factors of the environment. Product mix, composition of products, introduction of new products, changing the layout system is some of the representative decisions which respond to environmental feedback.

Apart from these factors, the production system designer should pay full attention to two other important problems, viz.

(i) Human factor, i.e., the impact of production systems on the workers operating it and

(ii) Research and development activities. These two problems have a vital impact on production system designing.

Importance of Production Management

Helps to Introduce New Products: Production management helps to introduce new product within the market. It conducts analysis and development. This helps the firm to develop newer and higher quality product. These products are productive within the market as a result of the offer full satisfaction to the purchasers.

1. **Expansion of the Firm:** the production management helps the firm to get bigger and grow. This is often as a result of it tries to enhance quality and cut back prices. This helps the firm to earn higher profits. These profits facilitate the firm to expand and grow.
2. **Minimizes price of Production:** Production management helps to reduce the value of production. It tries to maximize the output and minimize the inputs. This helps the firm to attain its price reduction and potency objective.
3. **Accomplishment of Firm's Objectives:** Production management helps the business organization to attain all its objectives. It produces

product that satisfy the customer's wants and needs. So, the firm can increase its sales. This can facilitate it to attain its objectives.

4. **Reputation, Goodwill and Image:** Production management helps the firm to satisfy its customers. This will increase the firm's name, goodwill and image. An honest image helps the firm to expand and grow.
5. **Helps to Face Competition:** Production management helps the firm to face competition within the market. This can be as a result of production management produces product of right amount, right quality, and right value and at the correct time. These product are delivered to the purchasers as per their necessities.
6. **Optimum Utilization of Resources:** Production management facilitates optimum utilization of resources like work force, machines etc. therefore the firm will meet its capability utilization objective. This may bring higher returns to the organization.
7. **Supports different useful Areas:** Production management supports different useful areas in a corporation, like selling, finance and personnel. The marketing department can notice it easier to sell good-quality product and therefore the finance department can get a lot of funds as a result of increase in sales. it'll conjointly get a lot of loans and share capital for enlargement and modernization. The staff office are going to be ready to manage the human resources effectively because of the higher performance of the production department.

Role of Production Managers

1) Forecasting the requirements of the production in order to achieve the production target.

2) Making most efficient utilization of the available sources for production.

3) Minimizing 'throughput time' and 'work in process inventory'. This can be achieved by systematic production planning and also by very efficient execution of the plans.

4) One of the most important responsibility of a production manager deals with reducing material handling cost, which generally is achieved by the use of efficient material handling system and also by using plant layouts which must be developed in a proper or correct way.

5) Reducing the quality cost with the help of analysis of non conformances on periodic basis and also by following suitable actions (both corrective and preventive).

6) Building team spirit among the workmen and also motivating by means of personal involvement. This task of motivation can also be achieved by designing and implementing suitable financial incentive schemes.

7) To device accurate methodology involving method study of manufacturing, along with the other engineering economic principles.

8) Improving the productivity level of the workers on continuous basis by workmen's training and by bringing into use the standards of the performance derived from work measurement studies etc.

Types of Production Process

The final decision regarding any particular method of production is very much affected by the nature of the products and the quantity to be produced. Production methods may be broadly classified as Job Production, Batch production and Mass or Flow Production.

(I) Job Production:

Under this method peculiar, special or non-standardized products are produced in accordance with the orders received from the customers. As each product is non- standardized varying in size and nature, it requires separate job for production. The machines and equipment's are adjusted in such a manner so as to suit the requirements of a particular job.

Job production involves intermittent process as the work is carried as and when the order is received. It consists of bringing together of material, parts and components in order to assemble and commission a single piece of equipment or product.

Ship building, dam construction, bridge building, book printing are some of the examples of job production. Third method of plant layout viz., Stationery Material Layout is suitable for job production.

Characteristics:

The job production possesses the following characteristics.

1. A large number of general purpose machines are required.

2. A large number of workers conversant with different jobs will have to be employed.

3. There can be some variations in production.

4. Some flexibility in financing is required because of variations in work load.

5. A large inventory of materials, parts and tools will be required.

6. The machines and equipment setting will have to be adjusted and readjusted to the manufacturing requirements.

7. The movement of materials through the process is intermittent.

Limitations:

Job production has the following limitations:

1. The economies of large scale production may not be attained because production is done in short-runs.

2. The demand is irregular for some products.

3. The use of labour and equipment may be an inefficient.

4. The scientific assessment of costs is difficult.

(II) Lot Production

A form of organization of production wherein an enterprise simultaneously man ufactures a broad assortment of products ofthe same kind and the production pro cess is repeated over a long period of time. Lot production is used most widely i nmachine building and metalworking. (In Russian, lots of complex articles are c alled *serii*, and lots of parts, or components,are *partii.)* The manufacture of lots of products having the same standard dimensions is usually repeated at regular i ntervals.After one or more lots have been produced, changes are often made bef ore the production of a new lot begins: the designmay be altered, modifications may be made in the production process, or work stations may be rearranged and workers'skills improved. Lot production permits standardization of the design of parts and articles and makes possible the reductionof production processes an d equipment to a few common types.

Depending on the quantity of products in the lot, a distinction is made between l arge-lot, medium-lot, and small-lotproduction.

In large-
lot production, the product is manufactured continuously, in large quantities, for a period that is generally longer thana year. The enterprise specializes in the pr oduction of thoroughly mastered articles or of individual subassemblies or parts. Each shop of the enterprise specializes in the production of a particular item. Ea ch work station specializes in a particularoperation. This method of production makes extensive use of specialized machinery, production lines, and such means ofautomation as conveyers and feeders.

Large-
lot production permits the organization of preparatory operations on a scientific basis; such operations are assigned to a separate stage. The group of preparatory operations includes the design of thearticle and its parts, the development of ne w production processes, and the manufacture of tools and accessories. Large-lotproduction is similar in character to mass production.

In medium-
lot production, specialization is limited by the manufacture of a smaller assortm ent of products. Production linesand shops are specialized with respect to the pr oducts manufactured and the production processes used. Preproduc-tionpreparation is generally separate from the basic manufacturing process. Med ium-
lot production is characteristic of, forexample, the building of machine tools and motors and the manufacture of many types of rolled ferrous and nonferrous met alproducts.

Small-
lot production is a transitional form between unit production and the manufactur e of products in moderate-
sized lots.The manufacture of articles or individual parts generally occurs once and is not repeated. The sizes of the lots vary. Thescale of the product is limited to existing orders or contracts. For this reason, the manufacture of a particular p roduct endscomparatively quickly, and a new product is then introduced into ma nufacture. Small-
lot production is used, for example, inthe manufacture of some special-
purpose alloys and rolled products and in the manufacture of small lots of articl es ormachines intended for experimentation under various conditions. Small-
lot production differs from experimental production,which is generally limited t o the manufacture of a single sample.

Because of its technical and organizational characteristics, lot production has a number of economic advantages over unitproduction: the production is shortene d, product quality is improved, labor productivity is raised, and costs are lowere d.These advantages result in increased efficiency of social production.

(III) Batch production:

Batch production pertains to repetitive production. It refers to the production of goods, the quantity of which is known in advance. It is that form of production where identical products are produced in batches on the basis of demand of customers' or of expected demand for products.

This method is generally similar to job production except the quantity of production. Instead of making one single product as in case of job production, a batch or group of products are produced at one time. It should be remembered here that one batch of products may not resemble with the next batch.

Under batch system of production the work is divided into operations and one operation is done at a time. After completing the work on one operation it is passed on to the second operation and so on till the product is completed. Batch production can be explained with the help of an illustration. An enterprise wants to manufacture 20 electric motors.

The work will be divided into different operations. The first operation on all the motors will be completed in the first batch and then it will pass on to the next operation. The second group of operators will complete the second operation before the next and so on. Under job production the same operators will manufacture full machine and not one operation only.

Batch production can fetch the benefits of repetitive production to a large extent, if the batch is of a sufficient quantity. Thus batch production may be defined as the manufacture of a product in small or large batches or lots by series of operations, each operation being carried on the whole batch before any subsequent operation is operated. This method is generally adopted in case of biscuit and confectionery and motor manufacturing, medicines, tinned food and hardware's like nuts and bolts etc.

The batch production method possesses the following characteristics:

1. The work is of repetitive nature.

2. There is a functional layout of various manufacturing processes.

3. One operation is carried out on whole batch and then is passed on to the next operation and so on.

4. Same type of machines is arranged at one place.

5. It is generally chosen where trade is seasonal or there is a need to produce great variety of goods.

(IV) Mass or flow production:

This method involves a continuous production of standardized products on a large scale. Under this method, production remains continuous in anticipation of future demand. Standardization is the basis of mass production. Standardized products are produced under this method by using standardized materials and

equipment. There is a continuous or uninterrupted flow of production obtained by arranging the machines in a proper sequence of operations. Process layout is best suited method for mass production units.

Flow production is the manufacture of a product by a series of operations, each article going on to a succeeding operation as soon as possible. The manufacturing process is broken into separate operations.

The product completed at one operation is automatically passed on to the next till its completion. There is no time gap between the work done at one process and the starting at the next. The flow of production is continuous and progressive.

Characteristics:

The mass or flow production possesses the following characteristics.

1. The units flow from one operation point to another throughout the whole process.

2. There will be one type of machine for each process.

3. The products, tools, materials and methods are standardised.

4. Production is done in anticipation of demand.

5. Production volume is usually high.

6. Machine set ups remain unchanged for a considerable long period.

7. Any fault in flow of production is immediately corrected otherwise it will stop the whole production process.

Suitability of flow/mass production:

1. There must be continuity in demand for the product.

2. The products, materials and equipments must be standardised because the flow of line is inflexible.

3. The operations should be well defined.

4. It should be possible to maintain certain quality standards.

5. It should be possible to find time taken at each operation so that flow of work is standardised.

6. The process of stages of production should be continuous.

Advantages of mass production:

A properly planned flow production method, results in the following advantages:

1. The product is standardised and any deviation in quality etc. is detected at the spot.

2. There will be accuracy in product design and quality.

3. It will help in reducing direct labour cost.

4. There will be no need of work-in-progress because products will automatically pass on from operation to operation.

5. Since flow of work is simplified there will be lesser need for control.

6. A weakness in any operation comes to the notice immediately.

7. There may not be any need of keeping work-in-progress, hence storage cost is reduced.