MCE 519

PRODUCTION PLANNING AND CONTROL

INTRODUCTION

Production activity constitutes the transformation of materials into a desirable output (products). Production is a process or procedure developed to transform a set of inputs like manpower, materials, capital, information and energy into a specified set of outputs like finished products and services in proper quantity and quality, thus achieving the objectives of an enterprise.

It consists of series of sequential operations to produce a desired product acceptable to customers and meets the customer demand, with respect to the quality and intended function.

The efficiency of production is stated in terms of its ability to produce the products with required quantity and specified quality at predetermined cost and pre-established time.

Production Planning and Control (PPC) is a tool available to the management to achieve the stated objective because production is an organized activity which has got specific objectives. Production planning starts with the analysis of the given data, that is, demands for products, delivery schedule, etc., and on the basis of the information available, a scheme of utilization of firms resources like machines, materials and men are worked out to obtain the target in the most economical way. Once the plan is prepared, then the executions of plans are performed in line with the plan.

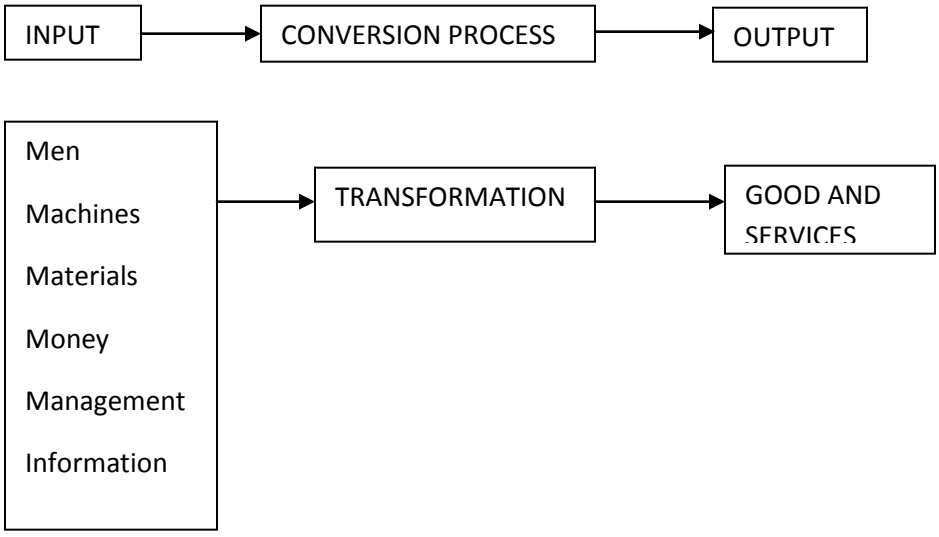

Fig. 1: Production System

Production control comes into action when there is any deviation between the actual and planned. Corrective action is to be taken so as to achieve the targets set as per plan by using control techniques. Thus production planning and control can be defined as “the direction and coordination of firm’s resources towards attaining the prefixed goals.

PPC helps to achieve uninterrupted flow of materials through production line by making available the materials at the right time and required quantity.

PRODUCTION PLANNING AND PRODUCTION CONTROL

Production planning

Production Planning is a pre-production activity. It is the pre-determination of manufacturing requirements such as manpower, materials, machines and manufacturing process.

Ray Wild defines "Production planning is the determination, acquisition and arrangement of all facilities necessary for future production of products. It represents the design of production system. Apart from planning the resources, it is going to organize the production.

Based on the estimated demand for company's products, it is going to establish the production programme to meet the targets set using the various resources.

Production Control

It is not possible to achieve 100 per cent production as per the plan, in spite of planning to the minute details. Some factors are responsible for this. They include:

i. Non-availability of materials (due to shortage etc)
ii. Plant, equipment and machine breakdown
iii. Changes in demand and rush orders
iv. Absenteeism of workers
v. Lack of coordination and communication between various functional areas of business.

Hence, peradventure there is any deviation between actual and planned production, the control function comes into action. Production control through control mechanism tries to take corrective action to match the planned and actual production. Thus production control reviews the progress of the work, and takes corrective steps in order to ensure that programmed production takes place. The essential steps in control activity are:

i. Initiating the production
ii. Progressing
iii. Corrective action based upon the feedback and reporting back to the production planning.

Production system can be compared to the nervous system with PPC as a brain.

OBJECTIVES OF PPC

1. Systematic planning of production activities to achieve the highest efficiency in production of goods and services.
2. To organize the production facilities like machines, men, etc., to achieve stated production objectives with respect to quantity and quality time and cost.
3. Optimum scheduling of resources.

4. Coordinate with other departments relating to production to achieve regular balanced and uninterrupted production flow.
5. To conform to delivery commitments.
6. Materials planning and control.
7. To be able to make adjustments due to changes in demand and rush orders.

IMPORTANCE OF PPC

1. It helps to accelerate the productivity of goods.
2. It minimizes the idleness of men and machines.
3. It optimizes the number of setups required.
4. It keeps in process inventories at a satisfactory level.
5. It reduces material handling and storage costs.
6. It serves to co-ordinate the activities of a plant.
7. It helps to meet the needs of change in demands due to trend, cyclical and seasonal factors.
8. It helps to take care of variety of uncertainties such as emergency order, breakdown, material shortages and various other contingencies.

COMPARISON BETWEEN PRODUCTION PLANNING AND PRODUCTION CONTROL

1. Production planning is a pre-production activity whereas production control will be in action when production activity begins.
2. Production planning involves the collection, maintenance and analysis of data with respect to some standards, materials and their specification, machines and their process capabilities whereas control is concerned with communication of their information and producing reports like output reports, productivity, rejection rate etc.
3. Planning is useful to anticipate the problems and devising remedial measure in case the problem arises while control involves in taking corrective steps in case of error to match actual performance against the planned performance.
4. Planning is a centralized activity and includes functions like material control, tool control, process planning and control whereas control is a widespread activity and includes functions such as dispatching, programming and inspection, etc.
5. Planning sees that all the necessary resources are available to make the production at right quality and time whereas control keeps track of the activities and sees whether everything is going as per schedule or not.

INFORMATION REQUIREMENT OF PPC

The effectiveness of production planning and control on a greater extent has to do with the accuracy of the information it receives from other departments. Listed below are the vital information required for a successful PPC function in an organization.

Table 1: Information Required for PPC

Information Required	Sources of Information	Department Responsible for Information
Production programme • Quantity to be produced • Delivery date • Variety and different models and special features	The sales order or the order accepted by the marketing department.	Marketing department
Quality standard specifications and tolerances	Engineering or design department who translate the customers' needs into specification.	Engineering purchase and stores
Production materials • Types of materials • Quality and quantity • Procurement lead time • Stock position	Drawing And Bill Of Materials (B.O.M), Material stock cards	PPC
Toolings	Standard and special toolings	PPC department
Operational details Sequence of operations Process capability of machines and equipment Jigs and fixtures needed Cutting parameters or process parameters	Process sheets Load charts Process capability studies	Industrial engineering
Standard time for operation and set up time	Work measurement data	PPC
Starting and finishing dates	Machine loads and schedule charts	Production
Progress of work (status of work)	Production reports	Production

PRODUCTION PROCEDURE

Production procedure (cycle) starts with the customer and ends up with satisfying needs of the customer by delivering products. Production procedure consists of:

1. **Sales forecast**: The marketing or sales department after a critical analysis and research or survey comes out with details like acceptability of the product by customers or consumers' reactions to new modifications and designs. Based upon the analysis of the data, sales department prepares a sales forecast with breakdown of products and models as function of time periods. Detailed forecast is submitted to the management.

2. **Preparation of production budget**: The production budget is prepared by the finance department in consultation with production department. The management reviews the forecast and budget to take decision regarding annual quantities to be produced.
3. **Engineering department to prepare details**: The department is instructed to prepare the drawing, B.O.M (Bills of Materials) specifications or to check and modify the existing ones.
4. **Production planning activity**: It begins as soon as the technical instruction is received from the engineering department. The production planning activity results in a schedule or time-table of production. The inventory levels are checked in order to initiate procurement activity of materials. Make or buy decision is made. The production planning section supplies the complete data on methods, process sheets, machine loading and production schedule to the dispatching section.
5. **Dispatching**: Detailed production orders are dispatched to the shop specifying what, how, when and where the operations are to be performed.
6. **Progressing**: Control action is exercised throughout the manufacturing period and progress is continuously compared with planned schedule so that suitable corrective steps are taken in case of difference between planned and actual production.
7. **Inspection**: Inspections are carried out and quality control ensures that the desired specifications are in conformance with the actual.
8. **Evaluation**: It is carried out after and before production so that corrective actions are devised to improve methods, down times and finally the management gets reports from both production and financial department.
9. The finished product is transferred to stock.
10. The product is finally delivered to the customer.

Hence, the production procedure requires the concerted and coordinated effort of all the functional departments of the organization.

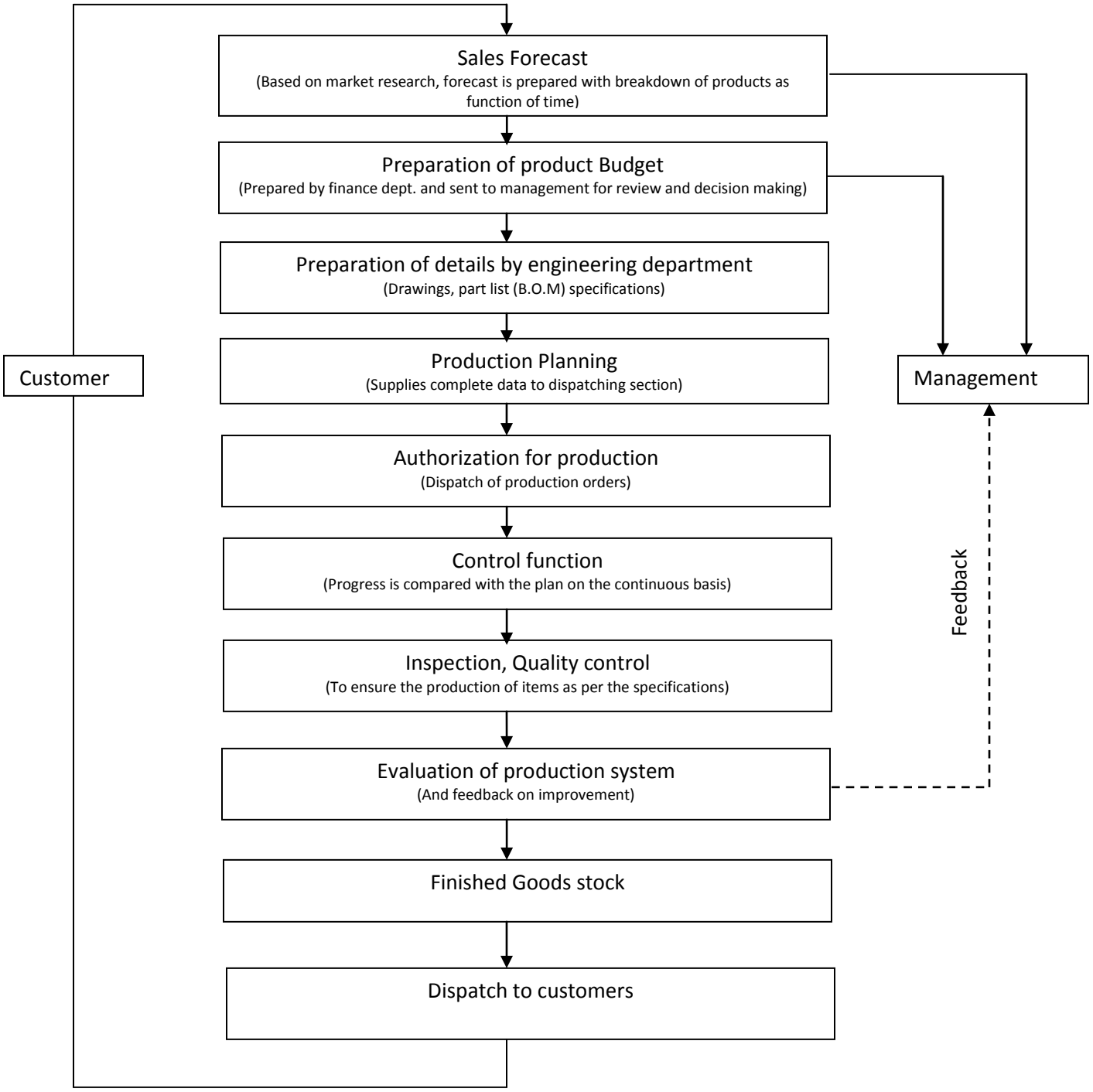

Fig. 2: Production Procedure

FUNCTIONS OF PPC

The highest efficiency in production is obtained by manufacturing the required quantity of product, of the required quality, at the required time by the best and cheapest method. The main functions of PPC can be classified into ten categories.

1. **Materials:** Raw materials, as well as standard finished products or parts and semi-finished products must be available when required to ensure that each operation of production will start on time. Duties include the specification of materials (both with respect to dimensions and quality), quantities and availability; delivery dates, standardization and reduction of variety, procurement and inspection.
2. **Methods:** The purpose is to analyze possible methods to manufacture and to try to define the best methods compatible with a given set of circumstances and facilities. This analysis covers with the general study and the selection of production processes and the detailed development and specification of methods of application. It results in determining the sequence of operations and the division of the product into assemblies and sub-assemblies, modified by the limitations of existing layout and work flow.
3. **Machines and equipment:** Methods of manufacture have to be related to available production facilities, coupled with a detailed study of equipment replacement policy. Maintenance policy, procedure and schedules are also functions connected with managerial responsibility for equipment. The duties include the analysis of facilities and making their availability with minimum down time because of breakdowns.
4. **Routing:** Once the overall methods and sequence of operations have been laid down, each stage in production is broken down to define each operation in detail, after which the issue of production orders can be planned. Routing prescribes the flow of work in the plant and is related to considerations of layout of temporary storage location for raw materials and components and of material handling systems. It is a fundamental production function on which all subsequent planning is based.
5. **Estimating:** When productions orders and detailed operation sheets available with specification feeds, speeds and use of auxiliary attachments and methods, the operation time can be worked out, that is, estimated. This function involves the extensive use of operation analysis in conjunction with methods and routing as well as work measurement in order to set up performance standards such as operation time.
6. **Scheduling:** It is planning the time element of production, that is, prior determination of work to be done. It consists of the starting and completion times for the various operations to be performed. In other words, scheduling function determines when an operation is to be performed or when work is to be completed, the difference lies in the details of the scheduling procedure. To work out effectively, the scheduling as a part of production control function, determines the time when each operation is called for on the route sheet which is to be done on the specified machine in order to meet the desired delivery dates. Good control functions directs not only the time that each particular operation should start but also indicates the progress of each manufacturing part, the amount of work ahead of each machine, and availability of each machine for the assignment.
7. **Dispatching:** It is the part of production control that translates the paper-work into actual production. Dispatching function proceeds in accordance with the details worked out under routing and scheduling functions. Dispatching authorizes the start of the production operations by releasing materials, components, tools, fixtures and instruction sheets to the operator and

ensures that material movement is carried out according to the planning routing sheets and schedules.

Dispatching implies the issuance or work orders. These work orders represent authority to produce. These orders contain the following information:

- The name of the product;
- The name of the part to be produced, sub-assembly or final assembly;
- The order number;
- The quantity to be produced;
- Descriptions and numbers of the operations required and their sequence;
- The department involved in each operations;
- The tools required for particular operation and
- Machines involved in each operation and starting dates for the operations.

8. **Expediting:** This control tool is the executive arm that keeps a close watch on the progress of the work expediting or follow up or progress. This function is designed to keep track of the work effort. The aim is to ensure that what is intended and planned is being implemented. Progressing function can be divided into three parts, i.e., follow-up of materials, follow-up of work-in-process and follow-up of assembly. It consists in reporting production data and investigating variances from predetermined time schedules. The main idea is to keep close liaison with scheduling in order to provide efficient feedback and prompt review of targets and schedules. The duties include the identification of bottlenecks and delays and interruption which may disrupt the production schedule; to devise action plans (remedies) for correcting the errors; and to see that the production rate is in line with schedule.
9. **Inspection:** It helps to do correct evaluation. It involves the quality control of the products looking into the methods and machines used in the production. It brings out the limitations of processes, methods and man-powers used in which these limitations can form a base for future investigations in evaluating with the view to improving production methods or indicating the cost implications of quality at the design stage. This is very much useful for the evaluation phase.
10. **Evaluating:** It is an essential link between control and future planning. It provides a feedback mechanism on a longer term basis so that past experience can be evaluated with the view to improving utilization of methods and facilities.

MANUFACURING METHODS AND PPC

Job production – Functions of PPC

i. Materials are purchased on receipt of the order.
ii. Standard tools are stocked and special tools are either made in house or purchased from outside.
iii. Process planning activity normally does not exist. Based upon drawings and specification, supervisor decides the work methods, fixes up the machines and estimates time for completion of the operation.

iv. Schedule is prepared to mark the beginning and finish of each activity. The day-to-day scheduling is at the discretion of the supervisor.
v. Progressing is through the meeting with the supervisors.

Batch production- Functions of PPC

Functions are more complex.

i. Materials control and tools control are more important and systematic stock replenishment system is essential.
ii. Detailed route sheets (process sheets) are prepared.
iii. Loading and scheduling are to be worked out with greater details.
iv. Progressing function is crucial as the detailed data is to be collected on the progress of the work.

Continuous production – Functions of PPC

i. Material function is critical.
ii. No tools control because of the nature of the plant.
iii. No process planning activity.
iv. Scheduling is restricted to final quantity required.
v. Progressing requires only recording of final production quantity.

Problems of PPC

PPC problems require two major types of decisions; one that relates to the design of the system and the other that relates to the operation and control of the system (that is both long run and short run decisions). The relative balance of the emphasis on such factors such as cost, services, reliability of both functional and time performance depends on the basic purposes of the enterprise and on the general nature of goods or service being produced.

A classification of problems is as follows:

1. Decisions at Macro-level: Decisions regarding the design of production system (Long run).
    a. Process design
    b. Work station design and equipment selection
    c. Flow of work (facilities planning and layout)
    d. Replacement policies
2. Decisions at Micro-level: Concerned with design of operation and control systems (Short run)
    a. Materials and tools control
    b. Inventory and production control
    c. Quality control
    d. cost control and improvements
    e. Labour control

REVIEW QUESTIONS

1. Explain Production planning and control
2. Explain the functions of PPC
3. What are the importances of PPC?
4. Compare production planning and production control.
5. What information are essential for efficient working of PPC?
6. What do you understand by “Production cycle (Procedure)?
7. PPC is the nerve centre of the organization. Explain
8. State the production problem areas
9. State the function of PPC for various types of manufacturing methods.