UNIT 11: PRODUCTION PLANNING AND CONTROL

UNIT STRUCTURE

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11.1 LEARNING OBJECTIVES

After going through this unit, you must be able to:

- explain the basic concept of Production Planning and Control (PPC)
- explain the various functions of Production Planning and Control (PPC)

- describe the elements of production control
- obtain an overview of techniques of Production Planning and Control (PPC)
- explain the types of Production Planning and Control (PPC) system

11.2 INTRODUCTION

In this unit, we are going to discuss the concept of Production Planning and Control (PPC), its functions, its elements and types. Proper implementation of these three concepts can play an important role in the production of any goods or in the delivery of any service. In fact, these concepts can lead to effective production process or service delivery process. In this context, the concept Computer-aided process planning (CAPP) may be mentioned. CAPP is a modern technique that involves the use of computer technology for process planning during manufacturing process of any product or component of the product. In fact, CAPP connects the following two concepts for planning of the process involved in manufacturing any product or component of the product:

(i) Computer Aided Drafting (CAD), and

(ii) Computer Aided Manufacturing (CAM).

11.3 OBJECTIVES OF PRODUCTION PLANNING AND CONTROL (PPC)

Production planning and control involves planning production in a manufacturing organisation before the start of actual production activities and subsequent implementation of control activities. These are done to ensure that the planned production is realized in terms of quantity, quality, delivery schedule and the cost of production. It involves the following types of decisions:

(i) Strategic decisions: It involves enormous thinking covering a longer time span through the organization's current mission and environment. This leads to setting of a guide for the future decision and results done at the top level management

(ii) Tactical decisions: These emphasize on aggregate products rather than on specific products over intermediate time horizon and are made at the middle level management

(iii) Operational decisions: These involve utilization of existing facilities rather than the creation of new facilities covering a shorter time span and are made at the bottom level management.

Objectives of Production Planning and Control:

The main objectives of production planning and control are:

(i) To deliver goods in required quantities to the customer in the required delivery schedule

(ii) To ensure maximum utilization of all resources

(iii) To coordinate between labour and machines and various supporting departments

(iv) To ensure production of quality products

(v) To minimize the product throughput time

(vi) To maintain optimum inventory levels

(vii) To maintain flexibility in manufacturing operations

(viii) To plan for plant capacities for future requirements

(ix) To remove bottlenecks at all stages of production and to solve problems related to production

(x) To ensure effective cost reduction and cost control

(xi) To prepare production schedules and ensure that promised delivery dates met

(xii) To produce effective results for least total cost

(xiii) To ensure routes and schedules for work that will ensure optimum utilization of materials, labour and equipments and machines to provide the means for ensuring that the operation of the plant is in accordance with these plans

(xiv) To contribute towards profitability of the enterprise

11.4 FUNCTIONS OF PRODUCTION PLANNING AND CONTROL (PPC)

Production Planning and Control (PPC) consists of two components, namely,:

(i) Production Planning

(ii) Production Control

Production Planning:

Production planning is an important aspect of Production and Operations Management. It involves the organisation of an overall manufacturing/operating system to produce a product.

Factors determining production planning procedures:

The following are the main factors determining production planning procedures:

(i) Volume of production

(ii) Nature of production processes

(iii) Nature of operations

Production planning and control has the following phases with functions mentioned as follows:

(i) Planning Phase: It has two categories of planning namely

(a) Prior/ Pre-production planning: It involves all the planning efforts which are taking place prior to the active planning. The modules of prior planning are product development and design, forecasting etc.

(b) Active Planning: It includes actual production planning which includes various activities directly related to the production at the micro level immediately following prior planning. The modules of active planning are process planning and routing, materials planning, tools planning etc.

(ii) Action Phase: It involves dispatching which is the transition from the planning phase to action phase. The tasks involved in dispatching are job order, store issue order, tool order etc.

(iii) Control Phase: It has the following major modules:

(a) Progress reporting: In this phase, data regarding what is happening with the job is collected as well as comparison with the present level of performance. These include data collected on materials rejection, process variations, equipment failures etc.

(b) Corrective Action: Such actions include provisions made for any unexpected events. Some corrective actions are creation of schedule flexibility, schedule modifications, make o buy decisions etc.

Functions of Production Planning:

The main functions of production planning are:

(i) Determination of the capacity of all manufacturing departments and to plan systematically coordinated and related production activities within the scope of the enterprise to meet sales requirements.

(ii) Translation of orders received from sales department into orders on the works department and to ensure steady plans of production activities.

(iii) Determination of means through which product manufacturing requirements such as materials and their necessary constituents such may be available in right quality and quantity at the right time.

(iv) Coordinate of a number of different department groups so that a fine balance of activities may be maintained.

(v) Promoting full utilization of plants.

(vi) Assisting workers to obtain right and increased earnings.

(vii) Training staff for effective performance of their duties.

Production Control:

Production Control aims at maintaining balance in the activities towards a goal or set of goals evolved during production planning. The functions of production control are as follows:

(i) Facilitating production of spare parts, assemblies and products of required quality and quantity at the required time.

(ii) To coordinate, monitor and provide feedback to the manufacturing management, the results of the production activities, analyzing and interpreting their significance and taking corrective action if necessary.

(iii) Facilitating optimum utilization of all resources.

(iv) Facilitating low cost production and reliable customer service.

11.5 ELEMENTS OF PRODUCTION CONTROL

The main elements of production control are explained below

11.5.1 ROUTING

Routing is the process to determine the best and cheapest sequence of operations in any production system and to ensure strict

implementation of this sequence. Routing deals with the specification of the flow of sequence of operation and processes to be followed in producing/ manufacturing a particular lot/ batch of products. Routing performs the following functions:

(i) It determines where work will be done on the product or parts and where and how it will be done.

(ii) It estimates the operations, their sequence, sequencing machines and personnel required for these operations in a proper manner.

(iii) It determines what to make and what to purchase.

The above functions of routing are based on the following issues of products produced:

(i) Relative cost,

(ii) Technical consideration

(iii) Purchasing policies,

(iv) Availability of equipment,

(v) Availability of skilled personnel

Again, the type of material needed is dependent on the following:

(i) It depends upon the drawing,

(ii) It depends upon the specifications,

(iii) It depends upon the standard of quality,

(iv) It depends upon the identification symbol,

(v) It depends upon the application in product.

Determination of lot sheet: It depends mainly upon the manufacturing involved. If the product is to be manufactured strictly to a sold order, the customers order plus a certain average or allowance of stock, the lot size depends upon the primary of economic lot quantities etc., the quantity to manufacture so that for which the sum of

the set-up and other preparation cost and the cost of carrying an inventory of the article manufactured at the minimum.

Factors Affecting Routing Procedure: Routing depends upon the following factors:

(i) Type of manufacturing employed.

(ii) Availability of production equipment, components and sub-components.

(iii) Nature of physical plant equipment, components and sub-components.

(iv) Nature, quality and skills of staff involved.

11.5.2 SCHEDULING

Scheduling refers to the process of allocation of resources applying the limiting factors of time and cost to perform a collection of tasks. Scheduling also includes specific determination of details of the production process during the next few weeks or months. This process involves determination of the individual machines that are going to produce the products, quantities of such products to be produced and the raw materials needed to produce. This, however, also includes other activities such as repair/ maintenance, movement of goods, materials and manpower. In fact, a production schedule is a total knowhow of how, when and where specific resources are to be used to produce specified output or results. Such production schedules, therefore, are indispensable in any production planning and control system. In this way, a schedule indicates a sequence of activities requiring sensitive controls and rapid response time. Scheduling can be either very simple or very complex. Perhaps the most simple type schedule can be illustrated by an example drawn from pottery industry. A worker may be asked to produce as given number of work to produce different types of earthen pots. Here, control is very simple and consists primarily of

a count made each week, when such pots are lifted by the employer.

Decision Rules: The complexity of scheduling function demands proper delegation of such job to the middle or lower management levels. Decision rules for scheduling should be fairly specific. These also help in the achievement of total organizational goals, provide consistency in scheduling practice so that schedules can be interpreted uniformly throughout the organization. There are many forms of decision rules. The selection of the particular rules will largely depend upon the following:

(i) Particular circumstance for which they are required.

(ii) Internal cost structures,

(iii) The nature of the product,

(iv) Capacity consideration etc

Examples of Possible Decision Rules: Examples of possible decision rules including the following:

(i) Initially scheduling the longest jobs.

(ii) Scheduling jobs in the order they are received.

(iii) Scheduling the job with the earliest delivery dates first.

(iv) Scheduling jobs on a random basis.

(v) Scheduling those jobs with the use production facilities for which we have the greatest idle capacity.

(vi) Scheduling all jobs first which requires operation in department.

(vii) Scheduling customers' order before all others.

Objectives of Scheduling: The objectives of scheduling are as follows:

(i) Determination of the sequence in which tasks are to be performed.

(ii) Determination the start time and finish time of each task.

Single Machine Scheduling:

It refers to scheduling of n jobs with the same single operation on each of the jobs. A single machine scheduling problem is characterized by the following:

(i) A set of independent, single-operation jobs is available for processing at time zero.

(ii) Set-up time of each job is independent of its position in the job sequence. So the set-up time of each job can be included in its processing time.

(iii) Job descriptors are known in advance

(iv) One machine is continuously available and is never idle when work is waiting

(v) Each job is processed till its completion without break

Flow Shop Scheduling:

It refers to scheduling of n jobs each requiring processing on m different machines. A flow shop scheduling problem is characterized by the following:

(i) A set of multiple-operation job is available for processing at time zero (each job requires m operations and each operation requires a different machine).

(ii) Set-up times for each operations are sequence independent, and are included in the processing times

(iii) Job descriptors are known in advance

(iv) m different machines are continuously available

(v) Each individual operation of jobs is processed till its completion without break

Example 11.1: Develop a proper sequence for the following five jobs processed in two machines- Machine A and Machine B in the order Machine A ----► Machine B. Processing time is given in hours.

Jobs	Machine A	Machine B
1	10	3
2	4	7
3	8	1
4	2	11
5	5	6

Determine the total processing time for the above five jobs.

Solution to Example 11.1: Given, for the following five jobs processed in two machines- Machine A and Machine B in the order Machine A ----► Machine B. Processing time is given in hours.

Jobs	Processing time in hours in	
	Machine A	Machine B
1	10	3
2	4	7
3	8	1
4	2	11
5	5	6

The minimum available processing time is 1 hour associated with Job 3 with respect to the Machine B. Keeping in view the order of processing in Machine A and Machine B as Machine A ----► Machine B, Job 3 will be allotted the last place in the job sequence.

The remaining minimum available processing time is 2 hours associated with Job 4 with respect to the Machine A. Keeping in view the order of processing in Machine A and Machine B as Machine A ----► Machine B, Job 2 will be allotted the first place in the job sequence.

The remaining minimum available processing time is 3 hours associated with Job 1 with respect to the Machine B. Keeping in view the

order of processing in Machine A and Machine B as Machine A ----► Machine B, Job 1 will be allotted the fourth place in the job sequence.

The remaining minimum available processing time is 4 hours associated with Job 2 with respect to the Machine A. Keeping in view the order of processing in Machine A and Machine B as Machine A ----► Machine B, Job 2 will be allotted the second place in the job sequence.

The last remaining Job 5 will be allotted the third place, i.e., the last remaining empty place in the job sequence.

As such, the resultant job sequence for the aforesaid problem will be:

4 ----►2 ----►5 ----►1 ----►3

Table: Determination of total processing time and total idle time in Machine B

Jobs	Processing in Machine A in Hours			Processing in Machine B in Hours			Idle time in Machine B in Hours
	In Time	Processing Time	Out Time	In Time	Processing Time	Out Time	
4	0	2	2	2	11	13	***2***
2	2	4	6	13	7	20	-
5	6	5	11	20	6	26	-
1	11	10	21	26	3	29	-
3	21	8	29	29	1	***30***	-

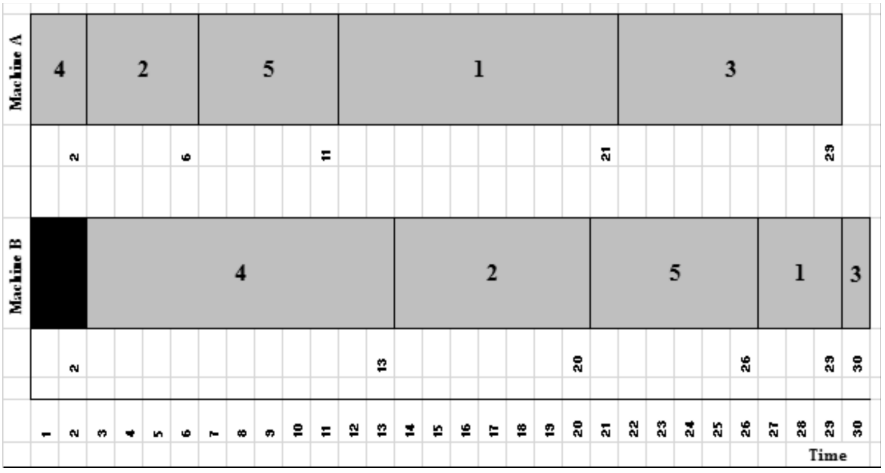


Figure: Gantt Chart for the given problem

From the above Table and Gantt Chart, it is seen that total processing time for all the jobs is 30 hours and total idle time in Machine B is 2 hours.

Job Shop Scheduling:

In job shop scheduling it is assumed that each job has m different operations. If some of the jobs are having less than m operations, required number of dummy operations with zero process times are assumed. By this condition equal number of operations for all jobs is ensured. A job shop scheduling problem is characterized by the following:

(i) Each job has m different operations

(ii) An operation number in the operations sequence may be same as the position number of the required machine

(iii) The time complexity function in job shop operations is combinatorial in nature

(iv) There is no initial machine that performs only the first operations of a job nor there is a terminal machine that performs only the last operations of a job

11.5.3 DISPATCHING

Dispatching is an indispensable component of production control. It aims in properly sending finished products to the designated destination(s). In relation to production planning and control, it refers to the allotment of work to different machines or work centres involving production of ant product in order of their priority as identified by scheduling. Dispatching leads to implementation of any production plan into reality as per a production schedule.

Functions of Dispatching: The main functions of dispatching are:

(i) Allotment of work to different machines of work place men.

(ii) Movement of material from stores to, within and out from the manufacturing process.

(iii) Issuance of tool orders.

(iv) Instructing the tool department to gather and make ready jigs and fixtures, before the start of any production operation.

(v) Issuance of time ticket, drawing, instruction cards & other necessary information presented performing the work.

(vi) Issuance of inspection order after each operation to separate good finished goods from damaged/defective goods or goods with non-conformities.

(vii) To identify the causes of spoilage.

(viii) Issuance of more orders and collection of time tickets, drawings, instruction cards for all completed operations.

(ix) Recording time of beginning and completion of jobs.

(x) Carrying out calculation relating to duration, forwarding of complete records to production department and time card

pay roll department.

(xi) Recording and reporting idle time of machine and operation.

Dispatching Procedure: The way in which schedule or orders are issued depends upon whether the dispatching is decentralized or centralized. These types of dispatching are discussed below:

(i) Decentralized dispatching: Here, the manufacturing schedules or work orders are issued to the foreman or dispatch clerk within each functional department in an organisation. It is the duty of this foreman or clerk to dispatch the orders of material to each machine and operator.

(ii) Centralized dispatching: This type of dispatching involves the dispatching of production orders from central dispatching division to individual machine/ work station. Here, the features and capacity of each machine is noted in central dispatching station.

In both the types of dispatching mentioned above, it is routine for interdepartmental communication to be informed of the starting dates, progress of each order. This is done by means of wall charts, visible index file etc.

Dispatching Rule: The different rules of dispatching are explained below:

Simple Rule:

(i) Earliest due date: This involves running the job with the earliest due date. This results in good date performance.

(ii) First come first served: This involves running the job which arrived in the waiting line first. This results in low variance of manufacturing cycle time.

(iii) Shortest processing time: This involves running the job which has the shortest set up plus machining for the current work centre.

Combination Rule:

(i) Minimum stock: This involves running use of slack which equals calendar time remaining minus processing time remaining. In other words, slack equals date minus present time minus set up and machining time all remaining operation.

(ii) Critical ratio: This involves running use of critical ratio. Critical equals 0 to due date minus present time divided by number of days required to complete the job order.

11.5.4 Expediting

Expediting refers to follow up which controls the progress of materials and parts through the production process. This is closely interrelated with dispatching activities in a production setup. In other words, expediting acts as a regulator of material and components parts when they are being transported along the production setup as described by the master production schedule. It is dependent upon the following:

(i) Materials: Expediting follows purchased materials which is the responsibility of the purchasing department. This can be simply completed by filling one copy of requisition in a daily follow up file or in ticket file according to the date of materials due to be received.

(ii) Work in progress: Expediting also depends upon work-in-progress. The flow of the latter in a production sequence is checked by examining the process and recording the production completed by production line for comparison purpose with preplanned schedules. This is normally done by follow-up men or expediters. They advice the foreman regarding the optimal sequence in which the orders can be fulfilled at right time and at the right place.

(iii) Assembly and Erection: Expediting also depends upon assembly and erection of the final finished product. This requires immense care in case of highly complicated products.



CHECK YOUR PROGRESS

Q 1: Which of the following is not a factor affecting routing procedure?

(a) Type of manufacturing employed

(b) Availability of production equipment

(c) Nature, quality and skills of staff involved

(d) None of these

Q 2: Which of the following refers to follow up which controls the progress of materials and parts through the production process?

(a) Inventory control (b) Expediting

(c) Routing (d) None of these

Q 3: Which of the following is a rule for dispatching in production control?

(a) Last in First Out (b) CAM

(c) Batch Production (d) First come first served

11.6 TECHNIQUES OF PRODUCTION PLANNING AND CONTROL

One of the primary technique of production planning and control is Programme Evaluation and Review Technique (PERT). PERT is discussed below in section 9.6.1.

11.6.1 Programme Evaluation And Review Technique (PERT)

Program (or Project) Evaluation and Review Technique, commonly abbreviated PERT, is a model for project management designed to analyze and represent the tasks involved in completing a given project. PERT is a method to analyze the involved tasks in completing a given project, especially the time needed to complete each task, and identifying the minimum time needed to complete the total project. PERT was developed primarily to simplify the planning and scheduling of large and complex projects. It was developed by Bill Pocock of Booz Allen Hamilton and Gordon Perhson of the U.S. Navy Special Projects Office in 1957 to support the U.S. Navy's Polaris nuclear submarine project.

Saline features of PERT:

(i) It is a tool for facilitating decision making involving activities and events in case of production planning and control.

(ii) Here, two successive events are connected by activities.

(iii) Here, activities are represented as arrows in PERT diagram.

(iv) Here, events are present in a logical sequence. No activity can be started until its immediately preceding event is completed.

(v) It enables any production planner to identify the critical activities that are to be present along the critical path in the PERT diagram.

Example 11.2: The following data is provided for a particular project:

Activity	Predecessor(s)	Duration (Weeks)		
		Optimistic Time	Most Likely Time	Pessimistic Time
A	--	1	2	3
B	--	1	2	3
C	A	2	2	8
D	B	6	7	8
E	A	1	2	3
F	C, D	1	4	7
G	E	1	5	9
H	F	1	2	9

(i) Construct the project network diagram

(ii) Determine the expected duration and variance of each activity.

(iii) Determine the critical path and the expected project completion time based on the critical path.

(Dibrugarh University MBA 3rd Semester Examination, 2005)

Solution to Example 11.2: Given, following data is provided for a particular project:

Activity	Predecessor(s)	Duration (Weeks)		
		Optimistic Time	Most Likely Time	Pessimistic Time
A	--	1	2	3
B	--	1	2	3
C	A	2	2	8
D	B	6	7	8
E	A	1	2	3
F	C, D	1	4	7
G	E	1	5	9
H	F	1	2	9

Let, t_o, t_m, t_p, t_e and ? indicate Optimistic Time, Most Likely Time, Pessimistic Time, Expected Time and Standard Deviation respectively.

(i) Determination of the expected duration and variance of each activity.

Activity	Duration (Weeks)			Expected Time $t_e = \frac{(t_o + 4\times t_m + t_p)}{6}$	Standard Deviation $\sigma = \frac{(t_p - t_o)}{6}$	Variance σ^2
	Optimistic Time (t_o)	Most Likely Time (t_m)	Pessimistic Time (t_p)			
A	1	2	3	2	0.33	0.11
B	1	2	3	2	0.33	0.11
C	2	2	8	3	1	1
D	6	7	8	7	0.33	0.11
E	1	2	3	2	0.33	0.11
F	1	4	7	4	1	1
G	1	5	9	5	1.33	1.78
Du	0	0	0	0	0	0
H	1	2	9	3	1.33	1.78

(ii) Construct the project network diagram

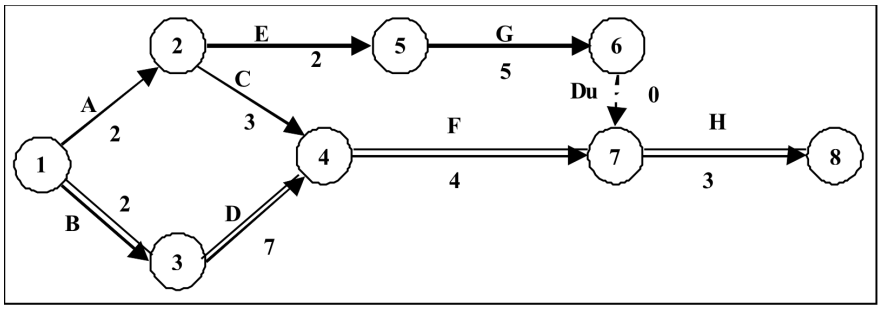


Figure: project network diagram

(iii) The possible paths for completion for completion of the entire project:

Sr. No.	Activities in the path	Duration (weeks)
1	A-E-G-Du-H	12
2	A-C-F-H	12
3	B-D-F-H	16

From the above table, it is seen that path B-D-F-H has the longest duration of 16 weeks compared to the other two paths for completion of the entire project. Therefore, path B-D-F-H is the critical path for the aforesaid project and activities B, D, F and H are critical activities.

Verification of path B-D-F-H as the above determined critical path for this project using Earliest Start Time (EST), Latest Start Time (LST), Earliest Finish Time (EFT), Latest Finish Time (LFT), and Slack.

Activity	Expected Time (t_e)	EST	LST	EFT	LFT	Slack = LST-EST = LFT-EFT	Remarks
A	2	0	2	4	6	4	-
B	2	0	2	0	2	0	Critical Activity
C	3	2	5	6	9	4	-
D	7	2	9	2	9	0	Critical Activity
E	2	2	4	6	8	4	-
F	4	9	13	9	13	0	Critical Activity
G	5	4	9	8	13	4	-
Du	0	9	9	13	13	4	-
H	3	13	16	13	16	0	Critical Activity

From the above table, it is seen that slack for activities B, D, F and H are zero, As such, it may be verified that these are critical activities and the path B-D-F-H is the critical path.

11.7 TYPES OF PRODUCTION PLANNING AND CONTROL SYSTEM

Production Planning and Control (PPC) systems are different for different types of production systems. These are explained below:

A) Production Planning and Control (PPC) systems in Job Shop Production:

In Job shop production, one or few quantity of products are designed and produced as per customer specification within a fixed time and cost limit. Here, Production Planning and Control (PPC) systems are so designed that it comprises of general purpose machines arranged into different departments with output products being produced in low volume and high variety.

Characteristics of Production Planning and Control (PPC) systems in Job Shop Production:

Production Planning and Control (PPC) systems in Job-shop production are so designed that they have the following features:

(i) Output products are produced in high variety with lesser volume.

(ii) It utilizes general purpose machines and equipments.

(iii) It requires highly skilled workers capable of completing each job which is unique.

(iv) It requires huge inventory of materials, equipments, and components.

(v) It requires proper planning for sequencing the requirements of each product and work centres.

Advantages of Production Planning and Control (PPC) systems in Job Shop Production:

Following are the advantages of Production Planning and Control (PPC) systems in Job Shop Production:

(i) Here, variety of products can be produced because of utilization of general purpose machines and facilities.

(ii) It enables workers to become more skilled because each job gives them learning opportunities.

(iii) It enables utilization of complete potential of workers.

(iv) It promotes greater opportunity for innovative methods and ideas.

B) Production Planning and Control (PPC) systems in Batch Production:

In batch production, a job passes through the functional departments in batches and each such batch may have a different routing. It is typified by the manufacture of limited number of products produced at regular intervals and stocked for future expected sales.

Characteristics of Production Planning and Control (PPC) systems in Batch Production:

Production Planning and Control (PPC) systems in Batch Production have the following features:

(i) It is optimal when there is shorter production runs.

(ii) It is optimal when plant and machinery are flexible.

(iii) It is optimal when plant and machinery set up is used for the production of item in a batch and change of set up is required for processing the next batch.

(iv) It is optimal when manufacturing lead time and cost are lower as compared to job order production.

Advantages Production Planning and Control (PPC) systems in Batch Production:

Following are the advantages of Production Planning and Control (PPC) systems in Batch Production:

(i) It involves improved utilization of plant and machinery.

(ii) It promotes functional specialization.

(iii) It involves lower cost per unit item as compared to job order production.

(iv) It involves lower investment in plant and machinery.

(v) It involves flexibility to accommodate and process number of products.

(vi) It provides greater job satisfaction for workers.

C) Production Planning and Control (PPC) systems in Mass Production:

In Mass production, manufacture of discrete parts or assemblies is made possible using a continuous process. This production system is characterized by very large volume of production. Here, the machines are arranged in product layout. In this type of production, product and process standardization exists and all outputs follow the same path.

Characteristics of Production Planning and Control (PPC) systems in Mass Production:

The main characteristics of Production Planning and Control (PPC) systems in Mass Production are:

(i) It involves standardization of product and process sequence.

(ii) It involves use of dedicated special purpose machines having higher production capacities and output rates.

(iii) It involves production of production in large volume.

(iv) It involves shorter cycle time of production.

(v) It involves lower in-process inventory.

(vi) It involves perfectly balanced production lines.

(vii) It involves continuous flow of materials, components and parts without any back tracking.

(viii) It involves easier production planning and control.

(ix) It involves automatic material handling.

Advantages of Production Planning and Control (PPC) systems in Mass Production:

Following are the advantages of Production Planning and Control (PPC) systems in Mass Production:

(i) It involves higher rate of production with reduced cycle time.

(ii) It involves higher capacity utilization due to line balancing.

(iii) It involves less skilled operators.

(iv) It involves lower in-process inventory.

(v) It involves low manufacturing cost per unit.

D) Production Planning and Control (PPC) systems in Continuous Production:

In case of continuous production, production facilities are arranged as per the sequence of production operations from the initial operations to the finished product. Here, raw materials, work-in-progress, finished products and other items are made to flow through the sequence of operations. This production system involves sue of material handling devices such as conveyors, transfer devices, etc.

Characteristics of Production Planning and Control (PPC) systems in Continuous Production:

The main characteristics of Production Planning and Control (PPC) systems in Continuous Production are:

(i) It involves dedicated plant and equipment with zero flexibility.

(ii) It involves automation of material handling.

(iii) Here, the entire process follows a predetermined sequence of operations.

(iv) Here, component materials cannot be readily identified with final product.

(v) It involves Planning and scheduling as a routine action.

Advantages of Production Planning and Control (PPC) systems in Continuous Production:

The main advantages of Production Planning and Control (PPC) systems in Continuous Production are:

(i) It involves standardization of product and process sequence.

(ii) It involves higher rate of production with reduced cycle time.

(iii) It involves higher capacity utilization due to line balancing.

(iv) It does not involve manpower for material handling as it is completely automatic.

(v) It involves use of persons with limited skills on the production line.

(vi) It involves lower unit cost of production due to high volume of production.

11.8 EFFECTIVE PRODUCTION PLANNING AND CONTROL (PPC)

For an effective Production Planning and Control (PPC), the following requirements should be met:

(i) Presence of good organization structure with proper delegation of authority.

(ii) Good information feedback system

(iii) Adaptability for changing environment.

(iv) Materials, equipments, tools and manufacturing process(es) should be properly standardized.

(v) Proper trained to personnel involved.

(vi) Good management policies and practices.

(vii) Lead time should be accurately calculated.

(viii) Adequateness of plant capacity to meet changing customer demands.

11.9 ADVANTAGES OF PRODUCTION PLANNING AND CONTROL

The advantages of Production Planning and Control are:

(i) It involves higher efficiency

(ii) It involves better quality

(iii) It involves better utilization of resources

(iv) It involves reduced inventories

(v) It involves reduced manufacturing cycle time

(vi) It involves timely delivery

(vii) It involves economy in production

(viii) It involves minimizing machine break-down

(ix) It involves minimizing idle time in manufacturing

(x) It involves proper flow of work in the manufacturing plant



CHECK YOUR PROGRESS

Q 4: What is the full form of PERT?

(a) Product Evaluation and Review Technique

(b) Program (or Project) Evaluation and Recording Technique

(c) Program (or Project) Evaluation and Review Technique

(d) Product Evaluation and Review Technology

Q 5: Which of the following is not an advantage of Production Planning and Control?

(a) Reduced inventories (b) Higher efficiency

(c) Economy in production (d) Untimely delivery

Q 6: "Production Planning and Control systems in Mass Production involve standardization of product and process sequence". In this context, state which of the following is correct?

(a) Always (b) Sometimes

(c) Never (d) None of these



11.10 LET US SUM UP

Production planning and control involves planning production in a manufacturing organisation before the start of actual production activities and subsequent implementation of control activities. The important points under Production planning and control discussed above are:

- Production planning is an important aspect of Production and Operations Management. It involves the organisation of an overall manufacturing/operating system to produce a product.
- Production Control aims at maintaining balance in the activities towards a goal or set of goals evolved during production planning.
- Routing is the process to determine the best and cheapest sequence of operations in any production system and to ensure strict implementation of this sequence.
- Scheduling refers to the process of allocation of resources applying the limiting factors of time and cost to perform a collection of tasks.
- Dispatching aims in properly sending finished products to the designated destination(s).
- Expediting refers to follow up which controls the progress of materials and parts through the production process.



11.11 FURTHER READINGS

- Industrial Engineering and Production Management by M.S. Mahajan, Dhanpat Rai and Company Private Limited, pp.780-784.
- Operations Management by M.S. Mahadevan, Pearson Education, pp.474-509.
- Production and Operations Management by K. Aswathappa K.S. Bhat, Himalaya Publishing House, pp.294-322.
- Production and Operations Management by K. Bedi, Oxford University Press.



11.12 ANSWERS TO CHECK YOUR PROGRESS

Ans. to Q. No.1: (d) None of these

Ans. to Q. No.2: (b) Expediting

Ans. to Q. No.3: (d) First come first served

Ans. to Q. No. 4: (c) Program (or Project) Evaluation and Review Technique

Ans. to Q. No. 5: (d) Untimely delivery

Ans. to Q. No. 6: (a) Always



11.13 MODEL QUESTIONS

Q. 1) Explain the role of Production Planning and Control in the engineering industry.

Q. 2) What do you understand by the term Production Planning and Control? Explain briefly the objectives of Production Planning and Control.

Q. 3) What is scheduling? Explain its significance in the control phase of production planning?

Q. 4) Define aggregate planning. State its objectives.

Q. 5) The following five jobs are to be processed in two machines, Machine L and Machine M in the order Machine L -----▶ Machine M. The processing time (in hours) for these jobs in these machines are shown in the following table. Find out the optimal job sequence, the total processing time, and total idle time for Machine M.

Jobs	Processing time in hours in	
	Machine L	Machine M
P	7	2
Q	3	6
R	4	7
S	7	4
T	5	3

Q. 6) A project consists of the following activities along with their completion time estimates.

Activity	Predecessor(s)	Duration (Weeks)		
		Optimistic Time	Most Likely Time	Pessimistic Time
P	--	2	5	8
Q	--	1	5	9
R	P	4	6	9
S	Q	2	2	2
T	P	1	2	9
U	R, S	2	4	5
V	R, T	3	8	10
W	U, V	1	2	3

(i) Construct the project network diagram

(ii) Determine the expected duration and variance of each activity.

(iii) Determine the critical path and the expected project completion time based on the critical path.

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