

# PRODUCTION PLANNING AND CONTROL: A COMPLETE REVIEW

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**Abstract:** *Production planning is “the administrative process that takes place within a manufacturing business and that involves making sure that sufficient raw materials, staff and other necessary items are procured and ready to create finished products*

*This paper reviews the production planning and scheduling in details the process involved, its techniques and more.*

**Keyword:** *Production Planning, Production Control, Production Scheduling*

## I. INTRODUCTION

Production is the most important activity of an enterprise. It occupies significant place in an organization because other functional areas of management viz., financing, marketing, personnel revolve around it. Production is concerned with transforming raw material into finished product with the help of energy, capital, manpower and machinery and is a very complex and tedious process.[1]

Production is carried on by following various production policies initiated by production department of an organization. The aim of a good production policy is to achieve maximum output with minimum input. It is of vital importance that production department of the organization should be managed in such a manner as to ensure economy in material resources and production time.[1]

Production management is primarily concerned with formulation and design of various production policies. Elwood S. Buffa has nicely explained the meaning of production management. According to him, “In a broader sense, production management is concerned with coordination of materials, men, methods, machines and money in manufacturing goods. In a narrow sense it means planning, scheduling and controlling the flow of materials through a plant”. [1]

In simple words, it can be concluded that production management is concerned with decision making relating to processes for producing goods and services in accordance with the pre-determined specifications and standards by incurring minimum costs.

Production policies and procedures are concerned with production planning and control. Production planning and control comprises of:

- (a) Production planning.
- (b) Production control.

## II. PRODUCTION CONTROL

There is lot of disagreement between different experts of management regarding the meaning of production control. The term itself appears to be quite confusing and misleading.

In literary sense control means action to check/regulate.[2]

In the opinion of Mary Gushing Niles, “Control is maintaining a balance in activities towards a goal or set of goals evolved during production planning.” Planning only outlines some course of action whereas control is an execution process involving standardisation, evaluation and corrective functions.

According to Fayol, “Control consists in verifying whether everything occurs in conformity with the adopted plan and established principles. The objective of control is to point out weaknesses and shortcomings, if any, in order to rectify them and prevent recurrence. It operates on everything viz. material, equipment, men, operations etc. For control to be effective, it must be applied within reasonable time and be followed-up sanctions.”[2]

Thus production control is some scientific procedure to regulate an orderly flow of material and co-ordinate various production operations to accomplish the objective of producing desired item. In right quantity of desired quality at the required time by the best and the cheapest method i.e., to attain highest efficiency in production.

Alternately, production control is the function of management which plans, directs and controls the material supply and processing activities of an enterprise; so that specified products are produced by specified methods to meet an approved sales programme. It ensures that the activities are carried in such a way that the available labour and capital are used in the best possible way.

## III. OBJECTIVES OF PRODUCTION CONTROL

The success of an enterprise greatly depends on the performance of its production control department.

The production control department generally has to perform the following functions:

- (i) Provision of raw material, equipment, machines and labour.
- (ii) To organise production schedule in conformity with the demand forecast.
- (iii) The resources are used in the best possible manner in such a way that the cost of production is minimised and delivery date is maintained.
- (iv) Determination of economic production runs with a view to reduce setup costs.
- (v) Proper co-ordination of the operations of various sections/departments responsible for production.
- (vi) To ensure regular and timely supply of raw material at the desired place and of prescribed quality and quantity to avoid delays in production.
- (vii) To perform inspection of semi-finished and finished

goods and use quality control techniques to ascertain that the produced items are of required specifications.

(viii) It is also responsible for product design and development.

Thus, the fundamental objective of production control is to regulate and control the various operations of production process in such a way that orderly flow of material is ensured at different stages of the production and the items are produced of right quality in right quantity at the right time with minimum efforts and cost. [3]

#### IV. FACTORS AFFECTING THE PRODUCTION PLANNING AND CONTROL

##### a) Use of Computers

Modern factories are using office automation equipment like PC, punch cards etc. It helps accurate computation of required of men and machine.

##### b) Seasonal Variations

Demand of certain products is affected by seasons, for instance umbrellas and raincoats during the monsoons and outputs. Production planning and control must take such changes into consideration while planning and control activities of inputs and outputs.

##### c) Test Marketing

In an aggressive marketing strategy new products are to be test marketed in order to know the trends. This is a short-cycle operation, intermittent in nature and often upsets regular production.

##### d) After Sales Service

This has become an important parameter for success. In after sales services, many items are returned for repair. These are unscheduled work and also overload the production line.

##### e) Losses due to Unpredictable Factors

Losses occur due to accidents, fire and theft of production inputs, mainly materials and components. These are unpredictable. Shortage of input due to such factors upset the planned production schedule in time and quantity.

##### f) Losses due to Predictable Factors

There are losses of inputs, due to natural d engineering phenomena like production losses and changes in consumption of materials and occurrence of defectives.

##### g) Production of Order

There are occasions when last minute prioritization of existing orders due to external pressure takes place. These changes in priority are often decided by sufficiently high level of management.

##### h) Design Changes

Design changes are issued by R & D and the engineering department. This will necessarily force production planning control change the input materials and process.

##### i) Rejection and Replacement

There are occasions when sub-assemblies or finished goods are rejected during stage or final inspection. Production planning and control must cater for contingent plans to take care of rework without affecting scheduled quality.

#### V. FUNCTION OF PRODUCTION PLANNING AND CONTROL

##### a) Estimating

Estimating involves deciding the quantity of products to be produced and cost involved in it on the basis of sales forecast. Estimating manpower, machine capacity and materials required to meet the planned production targets are the key activities before budgeting for resources.

##### b) Routing

Routing means, determination of path or route on which manufacturing operations will travel, establishing the sequence of operations to be followed in manufacturing a particular product. This route path is determined in advance. Routing information is provided by product or process engineering function and it is useful to prepare machine loading charts and schedules.

##### c) Scheduling

Scheduling involves fixing priorities for each job and determines the starting time and finishing time for each operation, the starting dates and finishing dates for each part, sub assembly and final assembly. Scheduling lays down a time table for production, indicating the total time required for the manufacture of a product and also the time required for carrying out the operation for each part on each machine or equipment.

##### d) Loading

Facility loading means loading of facility or work center and deciding which jobs to be assigned to which work center or machine. Loading is the process of converting operation schedules into practice. Loading ensures maximum possible utilization of productive facilities and avoids bottleneck in production.

#### VI. PRODUCTION SCHEDULING

Production scheduling problems have been the subject of intense academic research for the last three decades. Scheduling is a key factor for manufacturing productivity. Effective production scheduling can improve on-line delivery, reduce inventory, cut lead time, and improve machine utilization. Production scheduling problems are believed to be NP-hard where the computational requirements for achieving an optimal solution grow exponentially as the problem size increases. As a matter of fact, there has been a growing interest in the research field of production scheduling problems using different exact and approximate method algorithms.

Scheduling is a decision making process that plays a very important role in most manufacturing and service industries. Scheduling function deals with the determination of time-sequence of jobs, orders, tasks, and operations as well as the

allocation of the required resources to accomplish the related set of jobs, orders, operations, and tasks. [5,6]

#### VII. TECHNIQUES OF PRODUCTION SCHEDULING

##### Simple dispatching rules

A simple dispatching rule is a rule that prioritizes all the jobs to be processed on a machine, i.e. the prioritization scheme of the job-machine's attribute as well as the current time. The dispatching rules may be static in nature when they are not time-dependent or dynamic in nature when they are time-dependent.

##### Composite dispatching rules

More elaborate dispatching rules that consider a number of parameters can address more complicated objective functions. Some of these more elaborated rules merely combine a few of the basic dispatching rules. These elaborated rules are referred to as composite dispatching rules. Some measuring performance criteria should be used for the evaluation of the developed composite dispatching rule before the rule is released for regular use. An extensive computer simulation is often required for the evaluation process.

##### Computer simulation approaches

In computer simulation approaches (Averill 1991, Taha 1988), a complete structure of the shop, activities, jobs, and all other related constraints can be represented in some detail so that, given appropriate input data and simple heuristic dispatching rules at decision points, the computer could extrapolate a given schedule into the future at a relatively low cost. Investigators should generate various types of artificial or historical input data and simulate the effect of using different types of simple heuristics under different conditions.

##### Genetic Algorithms

GAs were invented by Holland (1975) to mimic some of the processes of natural evolution and selection. GAs are applied whose a population set of individuals as solutions is considered. Each individual is characterized by its fitness. The fitness of an individual is measured by associated value of the objective function. The procedure works iteratively, and each iteration is generation. The population of one generation consists of individuals surviving from the previous generation plus the new solutions or children from the previous generation. The population size usually remains constant from one generation to the next. The children are generated through reproduction and mutation of individuals that were part of the previous generation.

##### Artificial neural network

Artificial neural network (ANN) is a system loosely modeled on the human brain. The field goes by many names, such as connectionism; parallel distributed processing, neuro-computing, natural intelligent systems, machine learning algorithm, and artificial neural networks. It is an attempt to simulate within specialized hardware or sophisticated software. This simulation is achieved through multiple layers of simple processing elements called neurons. Each neuron is

linked to a certain of its neighbors with varying coefficients of connectivity that represent the strengths of these connections. Learning is accomplished by adjusting these strengths to cause the overall network to output appropriate results. [6]

#### VIII. CONCLUSION

Production planning and Scheduling incorporates a multiplicity of production elements, ranging from the everyday activities of staff to the ability to realize accurate delivery times for the customer. With an effective production planning operation at its nucleus, any form of manufacturing process has the capability to exploit its full potential..

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