UNITIII PRODUCT PLANNING AND PROCESS PLANNING 9

Product planning-Extending the original product information-Value analysis-Problems in lack of product planning-Process planning and routing-Pre requisite information needed for process planning- Steps in process planning.

Production planning: It is defined as the determination, acquisition and arrangement of all facilities necessary for future production of products. Production planning is a managerial function which is mainly concerned with the following important issues:

- What production facilities are required?
- How these production facilities should be laid out in the space available for production?
- How they should be used to produce the desired products at the desired rat e of production?
- t involves management decision relating to how much to produce, what materials, part and tools will be required, what steps should be completed and how much work is to be done by each work station. It is a pre-production activity.
- It is the pre determination of manufacturing requirements such as manpower, materials, machines and manufacturing process.
- Production planning is dynamic in nature and always remains in fluid state as plans may have to be changed according to the changes in circumstances.
- According to Mikell P.Groover, production planning is concerned with.
- Deciding which products to make, how many of each, and when they should be completed.
- Scheduling the production and delivery of the parts and products
- Planning the manpower and equipment resources needed to accomplish the production plan.

Levels of production planning: It can be done at three levels:

1. Factory planning,
2. Process planning,
3. Operation planning

Factors determining production planning:

- Volume of production,
- Nature of production processes,

- Nature of operations

Requirements of production planning:

- It should be based on accurate data.
- It must be flexible, simple and straight forward.
- It must satisfy a set of pre-defined objectives (economy, quality etc.).
- It must have a reporting syste m, so that right information reaches at right place and right time.
- It should not have any week link.

Production system

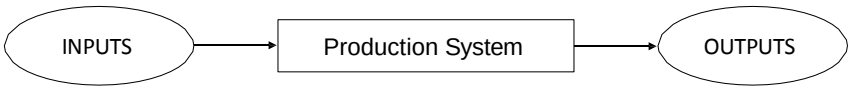

Fig.3.1: Production Systems

Functions of production system

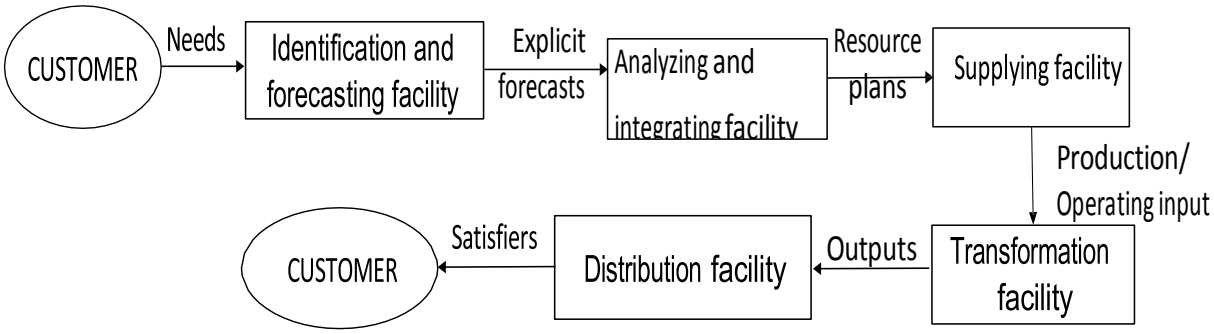

Fig.3.2: Functions of Production Systems

Process planning: Technology selection, process selection, machine selection, tool selection, process parameter selection, operation sequen cing etc.

- Itconsists of preparing set of instruction that describe how to manufacture the product and its parts.
- It is a detailed specification which lists the operation, tools and facilities.
- It is also known as operation planning, is the systematic determination of the engineering processes and systems to manufacture a product competitively and economically.
- Assembly and components drawings and bill of material list.
- Machine and equipment detail
- Various possible operaation that can be performed
- The maximum and minimum dimensions that can be machined on t he machines
- The accuracy of the dimensions that can be obtained
- Available feeds and speeds on the machine
- Standard time for each operat ion and details of setup time for each job
- Availability of machines, equ ipment and tools

Cycle of production functions

Fig.3.3: Cycle Production functions

Value analysis

Value analysis and Value Engineering:

- Value analysis is a techniqu e applied to identify unnecessary features o r components that can be eliminated in order to reduce the cost, without any reduction in the performance quality of the finished product.
- It focuses the attention of eng ineering, manufacturing, and purchasing on one objective – equivalent performance for lower cost.
- It results in the orderly utiliz ation of low cost alternative materials, low cost alternative processes including new processes, and abilities of specialized suppliers to procure items at lower costs.
- the value analysis is used to id entify efficiently the unnecessary cost,
- Value analysis refers to the analysis of an existing product, service or administrative

process while

- Value engineering refers to the same analysis applied to the product, services or administrative processes that are under design and have not been finalized.

Techniques of Value Analysis and Engineering that identifying and removing u nnecessary cost, and thus improving the value, must be done without reducing in the slightest degree quality, safety, life, reliability, Maintainability, and the features and attractiveness that the customer wants.

What is Value?

- Value is the relationship between the defined function the customer requir es and the costs incurred to provide that function.

Types of Economic value:

- Use value: The properties and qualities which accomplish a use, work, or service.

Esteem value: The properties, features, or attractiveness which causes us to want to own it

- Cost value: The sum of labor, material, and various other costs required to produce it.
- Exchange value: Its properties or qualities which enable us to exchange it for something else we ant.

When is VA/VE used?

- Existing part/product cost is high
- Existing technology is complex/old though simpler means are available
- There is a need to release a cheaper product by cutting down some of the existing feature
- The existing customer demands a minimal increment in product features that are in use
- There is a need to cut down the manufacturing cycle time/cost

- To determine the best design alternatives for Projects, Processes, Products, or Services
- To improve quality, increase reliability and availability, and customer satisfaction.

Benefits of Value Engineering:

- Decreasing costs
- Increasing profits
- Improving quality
- Expanding market share
- Saving time
- Using resources more effectively

Six Steps of Value Engineering

Job Plan

Value engineering is often done by systematically following a multi-stage job plan. Miles' original system was a six-step procedure which he called the "value analysis job plan." Depending on the application, there may be four, five, six, or more stages.

Blast: In this stage alternative product, materials, process, or ideas are generated.

- These alternatives should, first of all, qualify for accomplishing some important part of the function in a very economical manner or, at least, serve as an economical base for modifications that are
  likely to accomplish an important part of function.

Create: In create phase, the technique of "Use real creativity" needs to be employed to come out with ways by which the low cost alternatives identified during the blast stage can be modified to accomplish the specified function to a much greater extent with pertinent increase in cost.

Refine: In this step, much more creativity is used and also the techniques "Use industry experts to extend specialized knowledge" and "Utilize and pay for vendors' skills and knowledge" are used to refinethe ideas developed during the create step to come out with a refined alternative that fully accomplishes the specified function at a lower cost. During refine step, some more functionality is added as well as some additional cost.

Phase1. Orientation:(identify the product): Understand the customers' needs and wants.

- Understand the functions performed by the product and the contribution of each part and each feature of the part and the complete product to the functions to be performed by the product.

Phase2. Information:

Collection of information on quantities, vendors, drawings, materials, manufacturing methods, and costs.

Phase3. Speculation:

Using all the techniques of value analysis to come out with alternative low cost materials and methods to produce components and the product. Creativity is to be employed here. Value engineer has to involve experts from various disciplines to help with ideas.

Phase4. Analysis:

Refines and combines ideas, establish costs on all ideas, and ranks the ideas generated in the creativity phase. The two most common Value Method techniques used for ranking are "criteria weighting matrix and evaluation analysis ranking".

Phase5. Program planning:

Approach the specialists to further refine the selected alternatives. Inform the specialists the accepted suggestions and give mandate to them to take steps to implement the suggestions

Phase6. Program execution:

Pursue regularly the specialists and vendors to get their inputs on various tasks assigned to them. The output of this phase is a detailed design,

Phase7. Status summary and conclusion:

The results of the value engineering study are to be presented to decision

makers. The reports need to have a summary sheet as well as the full supporting documentation. The value engineering project is concluded when the product is manufactured and distributed at the lowered cost as per the value engineering study.

Introduction Process Planning

It is understood that the product design for each product has been developed in thedesign department. To convert the product design into a product, a manufacturing plan is required. The activity of developing such a plan is called process planning.
Process planning consists of preparing set of instructions that describe how to manufacture the product and its parts.
The task of process planning consists of determining the manufacturing operations required to transform a part from a rough (raw material) to the finished state specified on the engineering drawing. Process planning, also known as operations planning, is the systematic determination of the engineering processes and systems to manufacture a product competitively and economically.
Process planning is a detailed specification which lists the operations, tools, and facilities. Process planning is usually accomplished in manufacturing department.

Definition for Process Planning

Process planning can be defined as "an act of preparing a detailed processing documentation for the manufacture of a piece part or assembly."

According to the American Society of Tool and Manufacturing Engineers, "process planning is the systematic determination of the methods by which a product is to be manufactured, economically and competitively."

Importance of Process Planning

Process planning establishes the link between engineering design and shop floor manufacturing. Since process planning determines how a part/product will be manufactured, it becomes the important determinant of production costs and profitability. Also, production process plans should be based on in-depth knowledge of process and equipment capabilities, tooling availability, material processing characteristics, related costs, and shop practices. The economic futureof the industry demands that process plans that are developed should be feasible, low cost, and consistent with plans for similar parts. In addition, process planning facilitates the feedback from the shop floor to design engineering regarding the manufacturability of alternative.

Process Planning Activities

The different steps or specific activities involved in process planning are summarized in Table 1.

Drawing Interpretation

- The first step in the process planning is to analyse the finished partrequirements as specified in the engineering design. The engineering design may be shown either on an engineering drawing or in a CAD model format.
- The component drawings should be analysed in detail to identify its features, dimensions, geometric tolerances, surface finish specifications, the material specification and the number of parts required.
- The part's requirement defined by its feature, dimensions, tolerance specifications, etc., will determine the corresponding processing requirements (such as operations encompassing part shapegeneration, inspections, testing, heat treatment, surface coating, packaging, etc.)

Step 1:	**Drawing Interpretation**- Analysis of the finished part requirements as specified in the engineering design.
Step 2:	**Material Evaluation and Process Selection--** Evaluating the materials specified and determining the appropriate manufacturing processes.
Step 3:	**Selection of Machines, Tooling and Work holding Devices-**Selecting the proper equipment to accomplish the required operations.
Step 4:	**Setting Process Parameters-** Establishing specific parameters for each operation for each machine.
Step 5:	**Selection of Quality Assurance Methods-**Specifying the inspection criteria for all critical processing factors.
Step 6:	**Cost Estimating-**Estimating the manufacturing costs of producing a component/product.
Step 7:	**Preparing the Process Planning Documentation-** Preparing routing sheets and operations list.
Step 8:	**Communicating the manufacturing** knowledge to the shop floor

Operation & Route Sheet								
Component No……. Name of the component ……. Material …….				Drawing …… Quality …… To be completed on ……				
Routing		Operation N	Operation Description	Tools Reqd.	Fixtures & Others Accessories	Time		
Section	Machine					Setup	Operation	Total

1. Process Planning Methods (Approaches to Process Planning)

The two general methods / approaches to process planning

1. Manual process planning, and
   (i) Traditional approach, and
   (ii) Workbook approach.
2. Computer Aided Process Planning (CAPP)
   (i) Retrieval (or variant) CAPP system, and
   (ii) Generative CAPP system.

MANUAL PROCESS PLANNING

1. Traditional Approach

- In traditional process planning systems, the process plan isprepared manually.
- The task involves examining and interpreting engineering drawing, making decisions on machining process selection,equipment selection, operations sequence, and shop practices.

The manual process plan is very much dependent on the skill, judgement and experience of the process planner. That's why, ifdifferent planners were asked to develop a process plan for the same part, they would probably come up with different plans.

- The traditional process planning usually involves the

following three stages

Stage 1: The process planner interprets the component/product drawing using his own experience and intuition. Taking into account the type of resources available, he decides on how the component/product should be made. He lists the sequence of operations to be carried out in order to manufacture the product.

Stage 2: The process planner refers the manual to decide on tools, feeds, speeds, etc., for each element of each operation. Alsothe specific operation setup times and operation times for each operation are calculated using the manual.

Stage 3: Finally, the resulting process plan is documented as a routing sheet.

2. Workbook Approach

- The workbook approach is a modified version oftraditional approach of process planning that uses the developed workbook for preparing route sheet.
- In this approach, the workbooks of predeterminedsequence of operations for possible elements of operations of components/ products are developed. Once the drawing interpretation is carried out, the suitable predetermined sequence of operations are selected from the developed workbook and the details are documented in the route sheet.