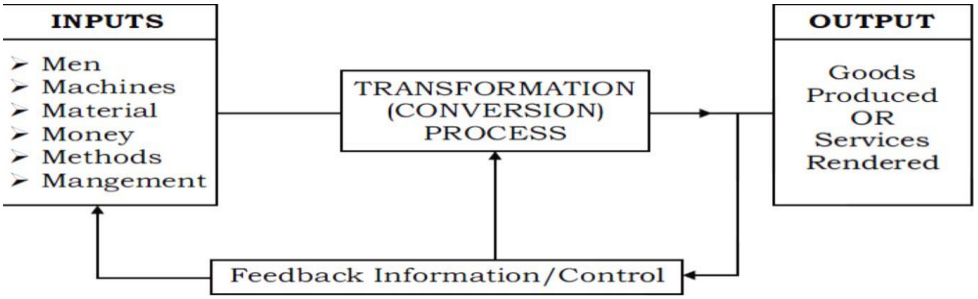
UNIT – I

Q. Defineproduction Management. Also Explainits Scope.

Ans. **Meaning and Definition of Production: –** Production may be defined as conversion of inputs-men, machine, materials, money, methods and management (6Ms) into output through a transformation process. Output may be goodsproducedor services rendered.

Systems Aspectsof Production Function:–



Definition of Production Management:–

"Production/Operations management is the process which combines and transforms various resources used in the Production/Operations subsystem of the organization into value added products/services in a controlled manner as perthe policies oftheorganization".

Thus production management is concerned with the decision making regarding the production of goods and services at minimum cost according to the demands of the customers through the management process of planning, organizing andcontrolling.

Production management is thus assigned with the following task:–

(1) Specifyingand accumulatingthe input resources i.e.

- Management
- Men
- Materials
- Machine
- Money
- Methods

(2) Designing and installing the assembly or conversion process to transform the inputs intooutput, and

(3) Co-ordinating and operating the production process so that the desired goodsandservicesmaybe produced efficientlyand at aminimum cost.

Scope of Production Management:

Production Management is a vast concept it involves a huge chain. Production starts with input and ends with output i.e. finished product. Following are the scope of production management

1. Location of Facilities

The selection of location is a key decision as large investment is made in building, land, and machinery.

2. Plant Layout & material handling

Plant layout refers to the physical arrangement of facilities. Material handling refers to the moving of material from the storeroom to the machine & from machine to the next during the process of manufacturing.

3. Product Design

Product design deals with the conversion of the ideas about the product into the reality

4. Process Design

It is the decision making on overall process route for converting the raw material into the finished goods

5. Production Planning & Controlling (P.P.C)

P.P .C can be defined as the process of planning the production in advance, setting the exact route of each item, fixing the starting & finishing dates for each item to give production orders to shops & to follow up the progress of products according to the orders.

6. Quality Control

Quality control may be defined

as a system that is used to maintain a desired level of quality in a product& service.

7. Material Handling

Material management is that aspect of management function which is primarily concern with the acquisition control & use of the needed material.

8. Maintenance Management

Maintenance deal with taking care of factory layout, types of machinery. This is essential for equipment & machinery which are a very important part of the total production process.

Functions of Production Management:

The components or functions of production management are as follows:

1. Selection of Product and Design,
2. Selection of Production Process,
3. Selecting Right Production Capacity,
4. Production Planning,
5. Production Control,
6. Quality and Cost Control,
7. Inventory Control, and
8. Maintenance and Replacement of Machines

The above functions of production management are briefly discussed below.

1. Selection of Product and Design

Production management first selects the right product for production. Then it selects the right design for the product. Care must be taken while selecting the product and design because the survival and success of the company depend on it. The product must be selected only after detailed evaluation of all the other alternative products. After selecting the right product, the right design must be selected. The design must be according to the customers' requirements. It must give the customers maximum value at the lowest cost.

So, production management must use techniques such as value engineering and value analysis.

2. Selection of Production Process

Production management must select the right production process. They must decide about the type of technology, machines, material handling system, etc.

3. Selecting Right Production Capacity

Production management must select the right production capacity to match the demand for the product. This is because more or less capacity will create problems. The production manager must plan the capacity for both short and long term's production. He must use break-even analysis for capacity planning.

4. Production Planning

Production management includes production planning. Here, the production manager decides about the routing and scheduling.

5. Production Control

Production management also includes production control. The manager has to monitor and control the production. He has to find out whether the actual production is done as per plans or not. He has to compare actual production with the plans and finds out the deviations. He then takes necessary steps to correct these deviations.

6. Quality and Cost Control

Production management also includes quality and cost control. Quality and Cost Control are given a lot of importance in today's competitive world. Customers all over the world want good-quality products at cheapest prices. To satisfy this demand of consumers, the production manager must continuously improve the quality of his products. Along with this, he must also take essential steps to reduce the cost of his products.

7. Inventory Control

Production management also includes inventory control. The production manager must monitor the level of inventories. There must be neither over stocking nor under stocking of inventories.

If there is an overstocking, then the working capital will be blocked, and the materials may be spoiled, wasted or misused.

If there is an under stocking, then production will not take place as per schedule, and deliveries will be affected.

8. Maintenance and Replacement of Machines

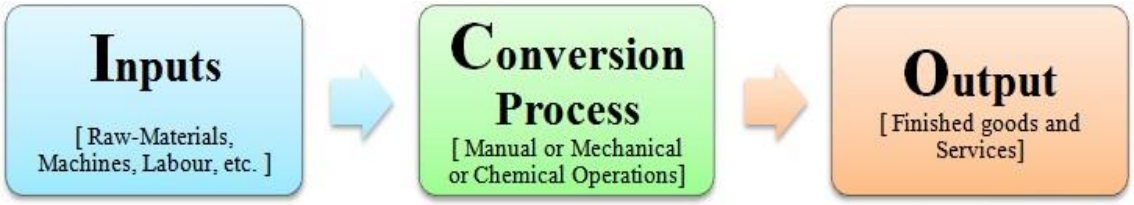
Production management ensures proper maintenance and replacement of machines and equipments. The production manager must have an efficient system for continuous inspection (routine checks), cleaning, oiling, maintenance and replacement of machines, equipments, spare parts, etc. This prevents breakdown of machines and avoids production halts.

Meaning of production system?

Production system consists of three main components viz., Inputs, Conversion Process and Output.

1. **Inputs** include raw-materials, machines, man-hours, components or parts, drawing, instructions and other paper works.
2. **Conversion process** includes operations (actual production process). Operations may be either manual or mechanical or chemical. Operations convert inputs into output. Conversion process also includes supporting activities, which help the process of conversion. The supporting activities include; production planning and control, purchase of raw-materials, receipt, storage and issue of materials, inspection of parts and work-in-progress, testing of products, quality control, warehousing of finished products, etc.
3. **Output** includes finished products, finished goods (parts), and services.

The three components of a production system are depicted in this diagram.



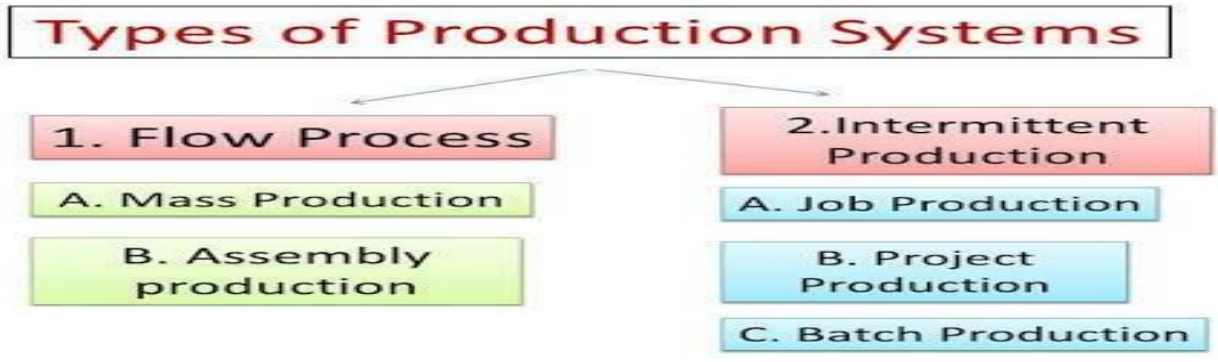
Hence, we can say that, production system is a union or combination of its three main components viz., Inputs, Conversion Process, and Output. In short, everything which is done to produce goods and services or to achieve the production objective is called production system.

Definition of Production System

"The methods, procedure or arrangement which includes all functions required to accumulate (gather) the inputs, process or reprocess the inputs, and deliver the marketable output (goods).”

Production system utilizes materials, funds, infrastructure, and labour to produce the required output in form of goods.

Types of Production System



Mass Production

- Mass production is the manufacturing of large quantities of standardized products, often using assembly lines or automation technology.
- Mass production facilitates the efficient production of a large number of similar products.

Assembly Production

- Assembly Production is an interactive application to manage production assemblies and the related process structure, often referred to as Work Breakdown Structure (WBS). It can handle products to be produced in one or more shipyards or production sites.

Job Production

- Job production is the manufacture of individual 'one-off' or unique items made to customer specifications.
- The product is seen through the whole process, from start to finish, by an individual or group of workers.
- The production of the next individual item does not begin until the previous job is complete.

Project Production

- Project production is characterized by complex sets of activities that must be performed in a particular order within the given period and within the estimated expenditure.
- Where output of a project is a product, such products are generally characterized by immobility during transformation.

Batch Production

- Batch production is a method of manufacturing where identical or similar items are produced together for different sized production runs.
- The method allows for products to be mass-produced in batches with small to major changes to the product, from car doors through to children's toys.

Meaning of Work Study:

Work study is “a term used to embrace the techniques of method study and work measurement which are employed to ensure the best possible use of human and material resources in carrying out a specified activity.” In other words, “work study is a tool or technique of management involving the analytical study of a job or operation.” Work study helps to increase productivity.

Objectives of Work Study:

(i) Work study brings higher productivity.

(ii) Work study improves existing method of work for which cost becomes lower;

(iii) It eliminates wasteful elements.

(iv) It sets standard of performance.

(v) It helps to use plant and human more effectively.

(vi) It improves by saving in time and loss of material also.

Steps Involved in Work Study:

The steps of work study are:

(i) It selects the jobs which are to be studied.

(ii) It examines critically the recorded facts which are already done.

(iii) It records from direct observations all the matters which are happened.

(iv) It defines new method.

(v) It also installs the new method.

(vi) It also maintains the new standard.

(vii) It develops most economic and appropriate methods.

(viii) It measures the work content in the methods, that is selected and compute a standard time.

Types of Work Study:

1. Method Study:

Method study is "the systematic recording, analysis and critical examination of existing and proposed ways of doing work and the development and application of easier and more effective method". In short, it is a systematic procedure to analyze the work to eliminate unnecessary operations.

Objectives:

The objectives of method study are:

(i) It improves the proper utilization of manpower, machine and materials.

(ii) It also improves the factory layout, work place, etc.

(iii) It also improves the process and procedure.

(iv) It develops better physical working environment.

(v) It reduces undesirable fatigue.

Steps:

The steps of method study are:

(i) At first select the proper work which are to be studied.

(ii) Record all the facts of existing method.

(iii) Examine the facts very critically.

(iv) Develop the most practical, economic, and effective method.

(v) Install the method and the same should be maintained.

2. Time And Motion Study:

Time Study means "a technique for determining as accurately as possible from a limited number of observations the time necessary to carry out a given activity at a different standard of performance". In other words, "time study is the art of observing and recording time required to do each detailed element of an individual operation." Practically, it studies the time taken on each element of a job.

Motion study, on the other hand, is the study of the body motion used in performing an operation, with the thought of improving the operation by eliminating unnecessary motion and simplifying necessary motion and thus establishing the most favorable motion sequence for maximum efficiency.

So, in short, 'Time Study' means the determination of standard time that is taken by a worker of average ability under normal working conditions for performing a job. But 'Motion Study' determines the correct method of doing a job to avoid wasteful movements, for which the workers are unnecessarily tired.

Steps:

1. Time and Motion studies eliminate wasteful movements.
2. They examine the proposed method critically and determine the most effective one.
3. They determine for each element having a stop-watch.
4. They record all the parts of a job which are done by the existing method.
5. They install the method as standard one.
6. They critically observe the workers who are engaged with the work.
7. They assess the proper speed of the operator who is working.

Work measurement:

Work measurement has been defined by British Standard Institution as, "The application of techniques designed to establish the time for a qualified worker to carry out a specified job at a defined level of performance". This time is called standard or allowed time. Time study may also be defined as "the art of observing and recording the time required to do each detailed element of an industrial operation".

Objectives of Work Measurement:

1. To compare the times of performance by alternative methods.
2. To enable realistic schedule of work to be prepared.
3. To arrive at a realistic and fair incentive scheme.
4. To analyse the activities for doing a job with the view to reduce or eliminate unnecessary jobs.
5. To minimise the human effort.
6. To assist in the organisation of labour by daily comparing the actual time with that of target time.

Uses of Work Measurement:

1. Wok measurement is used in planning work and in drawing out schedules.

2. Wok measurement is used to determine standard costs.
3. Wok measurement is used as an aid in preparing budgets.
4. It is used in balancing production lines for new products.
5. Wok measurement is used in determining machine effectiveness.
6. To determine time standards to be used as a basis for labour cost control.
7. To establish supervisory objectives and to provide a basis for measuring supervisory efficiency.
8. To determine time standards to be used for providing a basis for wage incentive plans.

Techniques of Work Measurement:

Work measurement is investigating and eliminating ineffective time. It not only reveals the existence of ineffective time. But it can be used to set standard times for carrying out the work so that ineffective time does not evolve later. It will be immediately found out by the increased standard time. For the purpose of work measurement, work may be regarded as repetitive work and non-repetitive work.

The principal techniques of work measurement are classified under the following heads:

1. Time Study.
2. Work Sampling.
3. Pre-determined Motion Time System.
4. Analytical Estimating.

UNIT-2

3. Explain Plant location and Plant layout?

Plant:

Plant Location:

- Plant location is place where both manufacturing and assembly unit is being established.
- It concerns with both manufacturing as well services.

Factors affecting plant location:

1. **Law and order situations**
2. **Availability of infrastructure facilities**
3. **Good industrial relations**
4. **Availability of skilled workforce**
5. **Social infrastructure**
6. **Investor- friendly attitude**
7. **Nearness to market**
8. **Nearness to source of raw material**
9. **Supping industries and services**
10. **Must meet safety requirements**

Plant Layout:

What is Plant Layout?

Plant layout is the overall arrangement of the production process, store-room, stock-room, tool-room, material handling equipment, aisles, racks and sub-stores, employee services and all other accessories required for facilitation of the production in the factory.

It encompasses production and service facilities and provides for the most effective utilization of the men, materials and machine' constituting the process, it is a master blueprint for coordinating all operations performed inside the factory.

Plant Layout Definition:

According to F G. Moore, " A good layout is one which allows materials rapidly and directly for processing. This reduces transport handling, clerical and other costs down per unit, space requirements arc minimized and it reduces idle machine and idle man time."

Objectives of Plant Layout:

- Minimization of material handling.
- Elimination of bottlenecks through the balancing of plant capacities.
- High material turnover through a shorter operating cycle.
- Effective utilization of installed capacity so that the returns on the investments may be maximized.
- Effective utilization of cubic space in the factory area.
- Effective utilization of manpower resources through the elimination of idle time.
- Elimination, improvement or confinement of objectionable operations e.g., operations with bad odour, vibrating operations etc.
- Elimination of physical efforts required by operative workers.
- Avoidance of industrial accidents.
- Better working conditions for the employees like lighting, ventilation, control of noise and vibrations etc.
- Decency and orderliness inside the plant area.
- Better customer services through cheaper and better product supplies according to the delivery promises.

Factors Affecting the Plant Layout Decision:

The decision of the plant layout is affected by the following factors:

Type of production: The layout for an engineering unit will be quite different from that of a flour factory, similarly layout of a paper mill will be different from a tool room and layout of an engine assembly line is different from the toy-making facility.

Production System: The plant layout in a continuous production system will be totally different from the intermitted production system.

Scale of Production: The plant layout and material handling equipment in the large scale organization will be different from that in the small scale manufacturing activity.

Type of Machines: The use of single-purpose and multipurpose machines substantially affects the plant layout. Similarly, noisy and vibrating machines require special attention in the plant layout decision.

Type of building facilities: The plant layout in a single storey building will be different from that in a multi-storey building.

Availability of Total Floor Area: The allocation of space for machines, workbenches sub stores, aisles, etc is made on the basis of the available floor area. Use of overhead space is made in case of shortage of space.

Possibility of Future Expansion: Plant layout is mad in the light of the future requirements and installation of additional facilities.

Arrangement of Material Handling Equipment: The plant layout and the material handling services are closely related and the latter has a decisive effect on the arrangement of the production process and plant services.

Type of Plant Layout:

The popular types of plant layout are:

Process layout

Product layout

Combined layout

Project layout

Group Layout

Process Layout:

This type of layout is also called functional layout. All machines performing a similar type of operations are grouped at one location in the process layout e.g., all lathes, milling, machines, cutting machines etc. in the engineering shop are clustered in their like groups. Thus all forging will be done in one area and all the lathes will be placed in another area.

Product layout:

In this type of layout, the machines are arranged in the sequence as required by the particular product. All machines as required to balance the particular product line are arranged in a sequential line but not necessarily in the straight line. It is also known as " the product line layout."

Combined Layout:

Generally pure process or pure product layout is not found in practice. Both process and product layouts are mutually exclusive. Proper compromise reaping the benefits of both the layouts is possible to some extent. So efforts are made to have the combined layout incorporating the benefits of process and product layout.

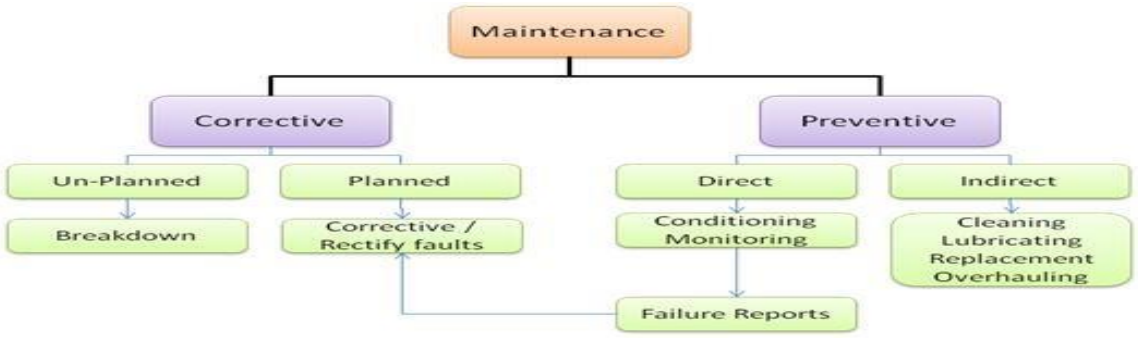
Project Layout:

The manufacturing operation requires the movements of men, machines and materials. Generally few inputs tend to be static while the others are moving.

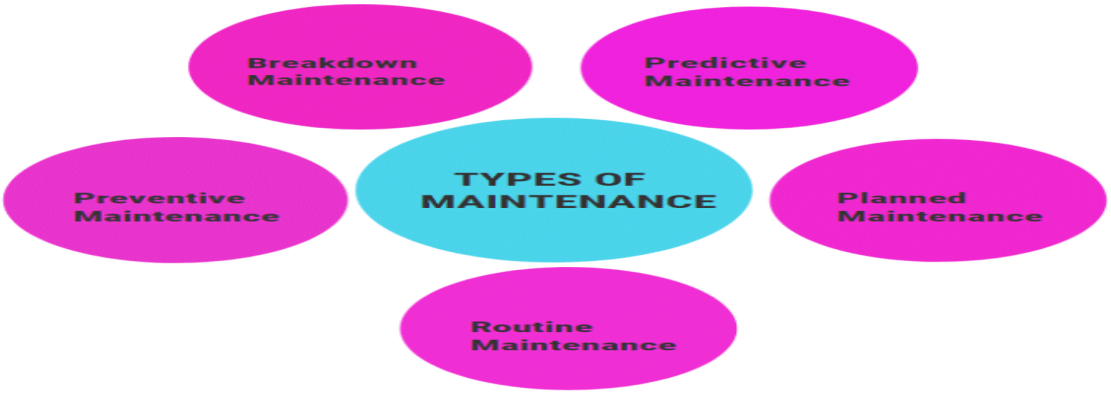
Plant maintenance:

- Plant maintenance-methods, strategies, and practices used to keep an industrial factory running efficiently.
- include anything from regular checks of equipment to make sure they are functioning properly, to cleaning garbage bins and toilets.
- The general aim of plant maintenance is to create a productive working environment that is also safe for workers.
- A maintenance plan can include scheduling times for equipment checkups, trouble-shooting, and general clean-up.
- each place of business generally has its own maintenance plan, tailored to its particularities.

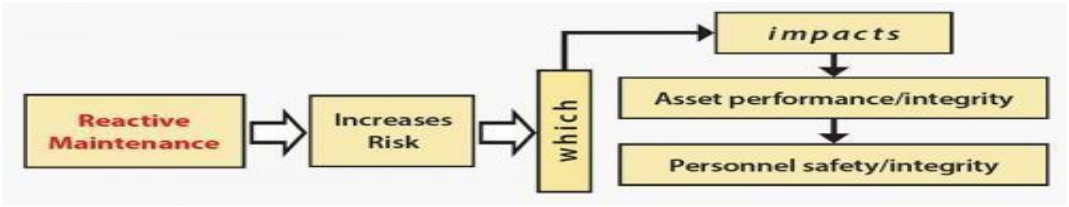
Maintenance:



Types of Plant maintenance:



Reactive maintenance:



- Reactive Maintenance can be described as responding to an event after it has happened.
- Generally categorize by profession.

Breakdown Maintenance:

Corrective or breakdown maintenance implies that repairs are made after the equipment is out of order and it cannot perform its normal function any longer, e.g., an electric motor will not start, a belt is broken, etc. Under such conditions, production department calls on the maintenance department to rectify the defect. The maintenance department checks into the difficulty and makes the necessary repairs. After removing the fault, maintenance engineers do not attend the equipment again until another failure or breakdown occurs.

This type of maintenance may be quite justified in small factories which:

(i) Are indifferent to the benefits of scheduling;

(ii) Do not feel a financial justification for scheduling techniques; and

(iii) Get seldom (temporary or permanent) demand in excess of normal operating capacity.

In many factories make-and-mend is the rule rather than the exception. Breakdown maintenance practice is economical for those (non-critical) equipment whose down-time and repair costs are less this way than with any other type of maintenance. Breakdown type of maintenance involves little administrative work, few records and a compara•tive small staff. There is no planned interference with production programmes-.

Typical Causes of Equipment Breakdown:

(i) Failure to replace worn out parts.

(ii) Lack of lubrication.

(iii) Neglected cooling system.

(iv) Indifference towards minor faults.

(v) External factors (such as too low or too high line voltage, wrong fuel, etc.)

(vi) Indifference towards -equipment vibrations, unusual sounds coming out of the rotating ma•chinery, equipment getting too much heated up, etc.

Disadvantages of Breakdown Maintenance:

(i) Breakdowns generally occur at inopportunate times. This leads to poor, hurried maintenance and excessive delays in production.

(ii) Reduction of output.

(iii) Faster plant deterioration.

(iv) Increased chances of accidents and less safety to both workers and machines.

(v) More spoilt material.

(vi) Direct loss of profit.

(vii) Breakdown maintenance practice cannot be employed for those plant items which are regulated by statutory provisions, for example cranes, lifts, hoists and pressure vessels.

Replacement policies:

Basic to the implementation of virtual memory is the concept of demand paging. This means that the operating system, and not the programmer, controls the swapping of pages in and out of main memory as they are required by the active processes. When a non-resident page is needed by a process, the operating system must decide which resident page is to be replaced by the requested page. The part of the virtual memory which makes this decision is called the replacement policy.

There are many approaches to the problem of deciding which page to replace but the object is the same for all--the policy which selects the page that will not be referenced again for the longest time.

Examples:

First In First Out (FIFO):

The page to be replaced is the "oldest" page in the memory, the one which was loaded before all the others

Least Recently Used (LRU):

The page to be replaced is the one which has not been referenced since all the others have been referenced

Last In First Out (LIFO):

The page to be replaced is the one most recently loaded into the memory

Least Frequently Used (LFU):

The page to be replaced is the one used least often of the pages currently in the memory

Optimal (OPT or MIN):

The page to be replaced is the one that will not be used for the longest period of time. This algorithm requires future knowledge of the reference string which is not usually available. Thus, this policy is used for comparison studies

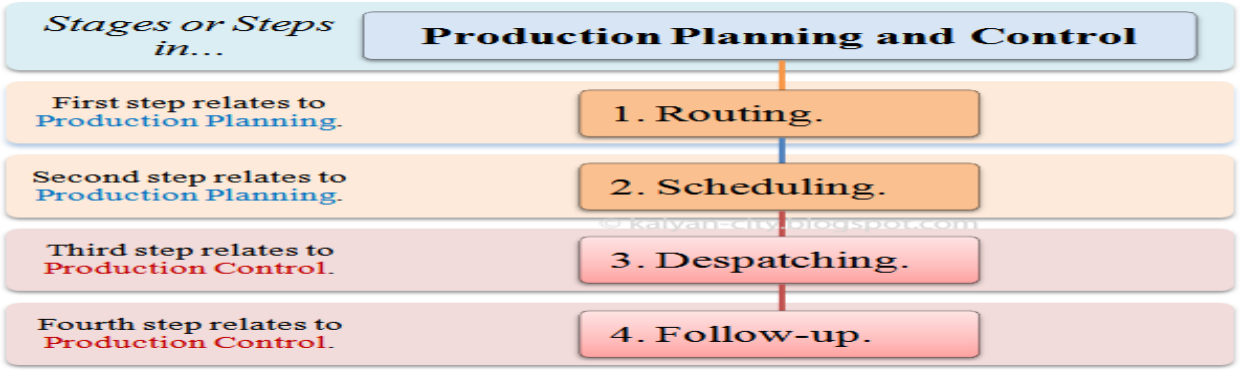
UNIT -3

Production planning and control:

Objectives of PPC:

- To deliver goods in required quantities to customers in required delivery schedule.ion
- To ensure maximum utilization of all resources
- To ensure production quality products
- To minimize the product throughput time
- To maintain optimum level inventory
- To maintain flexibility in manufacturing operations
- Coordinate between labour and machines and various supporting departments

Stages of production planning and control:



Areas of production control:

Sub-dividing the master schedule into manufacturing and subsidiary orders

-Routing

-Scheduling

-Despatching

-Expediting

-Tool keeping

Elements of Production planning:

- Planning
- Routing
- Scheduling
- Despatching
- Follow-up and Expediting
- Inspection

Planning:

It is the first element of production planning and control. Planning is deciding in advance what is to be done in future. An organisational set up is created to prepare plans and policies.

Routing:

Routing is determining the exact path which will be followed in production. It is the selection of the path from where each unit have to pass before reaching the final stage. The stages from which goods are to pass are decided in this process.

Scheduling:

Scheduling is the process of arranging, controlling and optimizing work and workloads in a production process or manufacturing process..... In manufacturing, the purpose of scheduling is to minimize the production time and costs, by telling a production facility when to make, with which staff, and on which equipment.

Despatching:

A station of moderate size may collect goods destined for a great variety of places but not in sufficient quantities to compose a full train-load for any of them, and then it becomes impossible to avoid despatching trains which contain wagons intended for many diverse destinations.

Follow-up and Expediting:

Follow up is routine order tracking to ensure the supplier can meet delivery promises. Progress inquiries may be made by phone, e-mail, fax or in person. Responsibility for follow-up with a service supplier may be placed in the user department to help ensure user compliance with prior commitments and deadlines.

Expediting is the application of pressure on a supplier to meet the original delivery promise, to deliver ahead of schedule, or to speed up delivery or a delayed order. THREATS OF ORDER CANCELLATION AND LOSS OF FUTURE BUSINESS MAY BE USED.

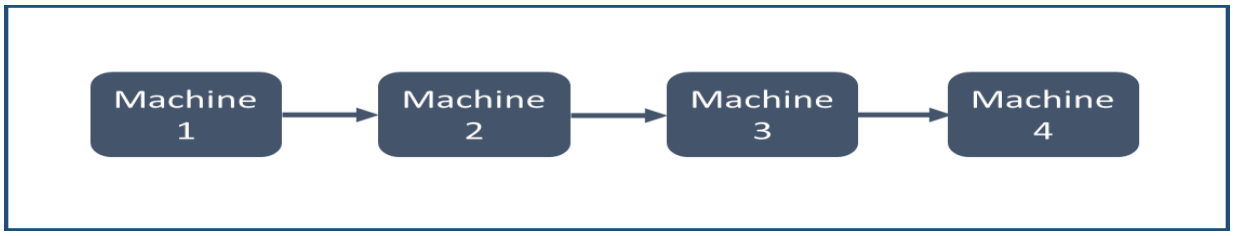
Inspection:

Careful examination or scrutiny.

Flow shop scheduling vs. Job shop scheduling?

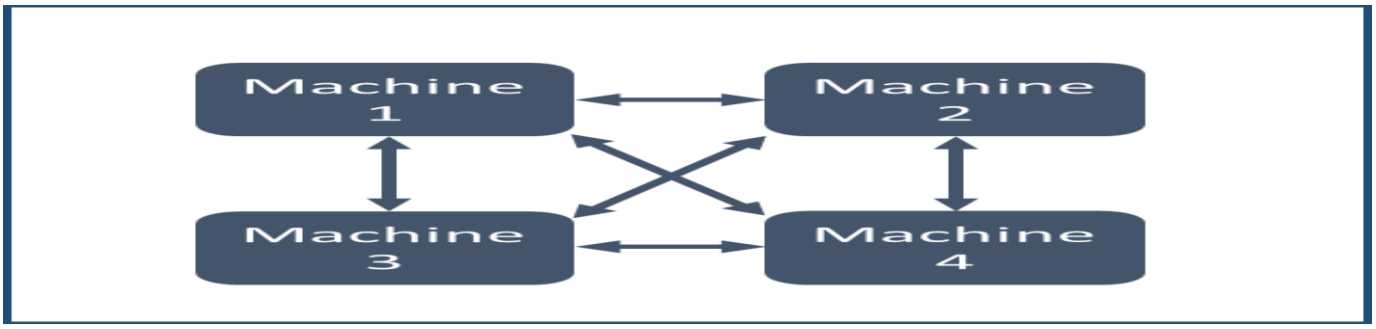
Flow shop - short characterization

In a flow shop, the manufacturing process follows a fixed linear structure. That means that all orders need to be manufactured in the same way on the same machines.



Job shop - short characterization

In a job shop, the routing of each job can be individual. That means that all orders (potentially) need to be manufactured differently on the same machines or a certain part of the same machines.



This gives a good first impression of the significant diversity of both manufacturing environments.
But in my eyes the best way to fully comprise the diversity, it is very useful to further characterize a flow shop and a job shop based on common criteria of the manufacturing industry.
To keep this as easy to understand as possible in the following I refer to the most extreme forms of flow shops and job shops possible.
In terms of a flow shop, this would be a manufacturing site with 100% standardization operated in an assembly production line. On the other hand, a job shop would be a business with 100% customization with a typical batch size of 1, which implies that every finished product is unique.

What Is Quality Control?

Quality control (QC) is a process through which a business seeks to ensure that product quality is maintained or improved. Quality control requires the company to create an environment in which both management and employees strive for perfection. This is done by training personnel, creating benchmarks for product quality, and testing products to check for statistically significant variations.

A significant aspect of quality control is the establishment of well-defined controls. These controls help standardize both production and reactions to quality issues. Limiting room for error by specifying which production activities are to be completed by which personnel reduces the chance that employees will be involved in tasks for which they do not have adequate training.

Understanding Quality Control

Quality control involves testing units and determining if they are within the specifications for the final product. The purpose of the testing is to determine any needs for corrective actions in the manufacturing process. Good quality control helps companies meet consumer demands for better products.

Quality testing involves each step of the manufacturing process. Employees often begin with the testing of raw materials, pull samples from along the manufacturing line, and test the finished product. Testing at the various stages of manufacturing helps identify where a production problem is occurring and the remedial steps it requires to prevent it in the future.

The quality control used in a business is highly dependent on the product or industry. In food and drug manufacturing, quality control includes ensuring the product does not make a consumer sick, so the company performs chemical and microbiological testing of samples from the production line. Because the appearance of prepared food affects consumer perception, the manufacturers may prepare the product according to its package directions for visual inspection.

In automobile manufacturing, quality control focuses on how parts fit together and interact and ensure engines operate smoothly and efficiently. In electronics, testing might involve using meters that measure the flow of electricity.

Quality Control Methods

There are several methods of measuring the performance of quality control. A quality control chart is a graphic that depicts whether sampled products or processes are meeting their intended specifications—and, if not, the degree by which they vary from those specifications. When each chart analyzes a specific attribute of the product, it is called a univariate chart. When a chart measures variances in several product attributes, it is called a multivariate chart.

X-Bar Chart

Randomly selected products are tested for the given attribute or attributes the chart is tracking. A common form of a quality control chart is the X-Bar Chart, where the y-axis on the chart tracks the degree to which the variance of the tested attribute is acceptable. The x-axis tracks the samples tested. Analyzing the pattern of variance depicted by a quality control chart can help determine if defects are occurring randomly or systematically.

Taguchi Method

The Taguchi Method of quality control is another approach that emphasizes the roles of research and development, product design, and product development in reducing the occurrence of defects and failures in products. The Taguchi Method considers design to be more important than the manufacturing process in quality control and tries to eliminate variances in production before they can occur.

100% Inspection Method

This 100% inspection method is a quality control process that involves looking at and assessing all parts of a product. This type of quality control is done to rule out flaws in products. This method is often used to evaluate valuable metals and produce. When conducting the 100% inspection method calls for data about the manufacturing process and software to analyze inventory.

The challenge for using this method is that looking at every single item that makes up a product is expensive, and it could destabilize or render the product unusable. For example, if you use this method to examine organic strawberries, you would risk the delicate berries being bruised or mushed, rendering them unsellable to customers.

Quality control methods help standardize both production and reactions to quality issues in various industries from food production to automobile manufacturing.

The Role of Quality Control Inspectors

Quality control inspectors protect the consumer from defective products and the company from damage to its reputation due to inferior manufacturing processes. If the testing process reveals issues with the product, the inspector can fix the problem himself, return the product for repairs, or tag the product for rejection. When issues arise, the inspector notifies supervisors and works with them to correct the problem.

The Benefits of Quality Control

Implementing quality control procedures ensures you are selling the best products to your customers. In addition, practicing quality control has a positive impact on employee conduct. Quality control can inspire employees to create high-quality goods leading to greater customer satisfaction.

Quality control protocols may help you lower your inspection costs and use your resources in a more cost-effective manner, too.

UNIT – 4

Materials management:

Materials management is a core function of supply chain management, involving the planning and execution of supply chains to meet the material requirements of a company or organisation. These requirements include controlling and regulating the flow of material while simultaneously assessing variables like demand, price, availability, quality, and delivery schedules.

Material managers determine the amount of material required and held in stock, plan for the replenishment of these stocks, create inventory levels for each type of item (raw material, work in progress or finished goods), and communicate information and requirements to procurement operations and the extended supply chain. Materials management also involves assessing material quality to make sure it meets customer demands in line with a production schedule and at the lowest cost.

Material management systems embrace all of the activities related to materials and are a basic business function that adds value to a finished product. It can also include the procurement of machinery and other equipment needed for production processes as well as spare parts.

Typical roles in Materials Management include inventory analysts, inventory control managers, materials managers, material planners, and expediters as well as hybrid roles like buyer/planners.

Regardless of role, the main objective of Materials Management is assuring a supply of material with optimised inventory levels and minimum deviation between planned and actual results.

The objectives of material management are sometimes referred to as the ‘Five Rs of Materials

Management:

The right material

At the right time

In the right amount

And of the quality that is:

At the right price

From the right sources

What are the Types of Material Management?

The work undertaken by materials management experts can be broken down into five different types, as **follows:**

1. Material Requirements Planning

This important step in material management directly affects profits as the lower the amount of material used, the lower the cost of production and the more profit is delivered. Reducing material overspend has

caused some industries to consider 'Just in Time (JIT)' strategies that require very small levels of inventory. However, this still requires careful planning to maintain without impacting production schedules.

2. Purchasing

Purchasing should be done economically and on time to maintain material supplies and increase final profits by lowering expenses.

3. Inventory Control

An inventory can include a range of goods being held including partially finished items, goods ready for sale and those used in production. Many industries try to time purchasing so that materials enter stores just ahead of production, although there is also a need to gauge supplier levels so items can be stocked before they become unavailable.

Inventories are required to control the flow of raw materials, purchased goods and finished parts and components.

4. Material Supply Management

Supply chain management can require materials to be distributed to different sites or production centres, each of which needs to be continuously supplied. Lack of stock can lead to financial losses through having to source replacement production materials or having to halt production schedules.

Poor storage can also lead to material supply disruptions through damaged or misplaced stock. Material management teams should be able to mitigate against these situations by using alternative supply systems.

5. Quality Control

Quality control of materials is also important, since good quality materials lead to good quality products. Factors such as durability, dimensional accuracy, dependability, performance, reliability and aesthetic value can all be important quality factors for materials management, depending upon the applications.

All five of these types need to work together for the successful management of materials from purchase and supply through to utilization.

Inventory control:

The fact or process of ensuring that appropriate amounts of stock are maintained by a business, so as to be able to meet customer demand without delay while keeping the costs associated with holding stock to a minimum.

Objectives of Inventory Control:

- To supply the materials in time
- To give maximum clients service
- To reduce or minimize investment in inventories
- To avoid shortage of stock
- To minimize the losses
- To meet unforeseen future demand.
- To minimize idle time by avoiding stock outs and shortages.

Types of Inventory management techniques:

1. ABC Analysis
2. Just In Time (JIT) Method
3. Material Requirements Planning (MRP) Method
4. Economic Order Quantity (EOQ) Model
5. Minimum Safety Stocks
6. VED Analysis
7. Fast, Slow & Non-moving (FSN) Method

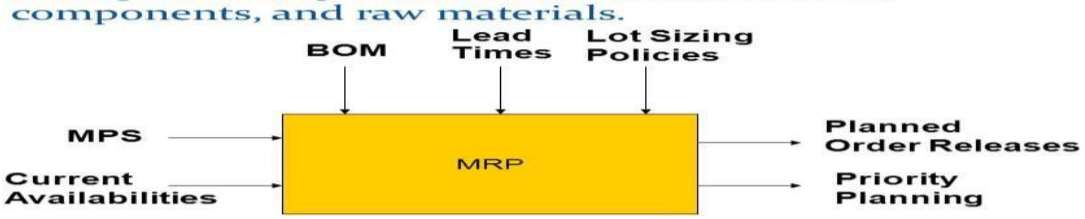
ABC Analysis:

Just In Time (JIT) Method:

- Uses a systems approach to develop and operate a manufacturing system
- Organizes the production process so that parts are available when they are needed
- A method for optimizing processes that involves continual reduction of waste

Material Requirements Planning (MRP) Method:

- Computer-based information system that translates master schedule requirements for end items into time-phased requirements for subassemblies, components, and raw materials.



Economic Order Quantity (EOQ) Method:

- Quantity of materials which can be purchased at minimum costs.
- It is the size of the lot to be purchased which is economically viable.
- The framework used to determine this order quantity is also known as Wilson EOQ Model or Wilson Formula.

$$EOQ = \sqrt{\frac{2 \times D \times S}{H}}$$

D = Annual demand (units)
S = Cost per order ($)
C = Cost per unit ($)
I = Holding cost (%)
H = Holding cost ($) = I x C

Fig. 26.1 EOQ MOdel

UNIT-5

9. What is Project Management? Evaluate its need and significance of it.

A project consists of interrelated activities which are to be executed in a certain order before the entire task is completed.

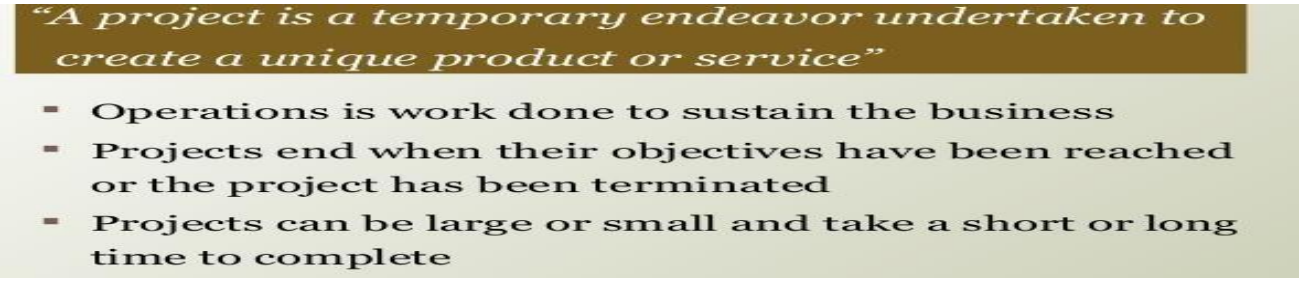
The activities are interrelated in a logical sequence which is known as precedence relationship.

A particular activity of a project cannot be started until all its immediate preceding activities are completed.

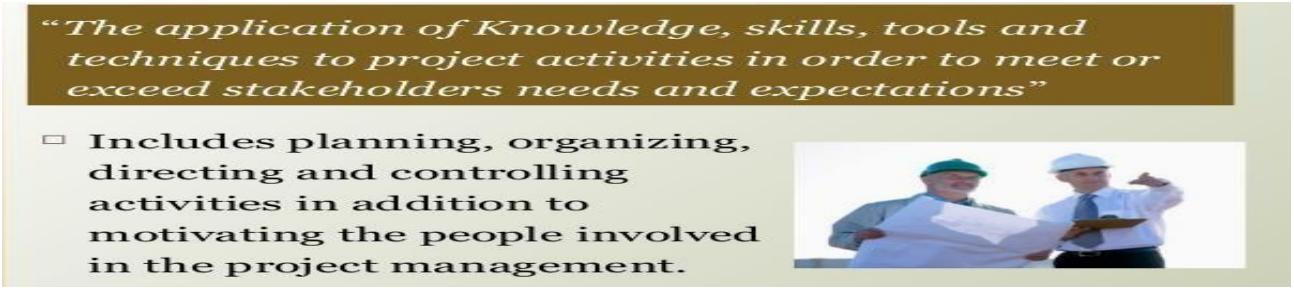
Some of the typical projects are as follows:

- Construction of a house
- Commissioning of a factory
- Construction of a ship
- Fabrication of a stream boiler
- Construction of a bridge
- Construction of a dam
- Commissioning of a power plant
- New product launching
- Launching a new weapon system
- Conducting national election
- Research to develop a new technology
- Construction of railway coaches

What is a project?



What is Project Management?



Needs of Project Management:

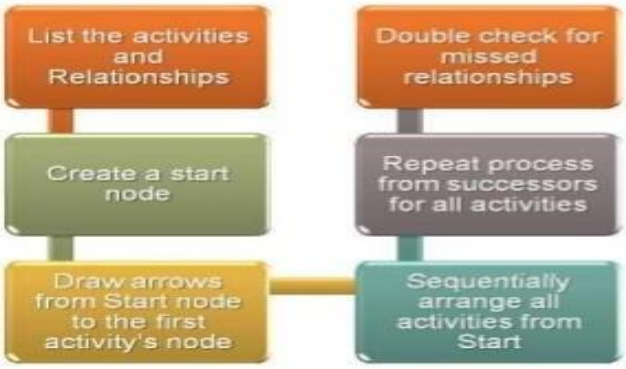
Significance of Project Management:

Examine the significance of PERT and CPM for a transport organization?

Critical Path Method:

The Critical Path Method or Critical Path Analysis, is a

- mathematically based algorithm for scheduling a set of project activities
- It is an important tool for effective project management
- Commonly used with all forms of projects, including
- construction, software development research projects, product
- development, engineering, and plant maintenance, among others
- Any project with interdependent activities can apply this method of scheduling



Advantages of CPM:

- Consistent framework for planning, scheduling, monitoring, and controlling project.
- Helps proper communications between departments and functions.
- Determines expected project completion date.
- Determines the dates on which tasks may be started or must be started if the project is to stay in schedule.
- Shows which tasks must be coordinated to avoid resource or timing conflicts.
- Shows which tasks may run in parallel to meet project completion date.

Disadvantages of CPM:

- Reliability of CPM largely based on accurate estimates and assumptions made.
- CPM does not guarantee the success of project.
- Resources may not actually be as flexible as management hope when they come to address network float.
- Too many activities may the network diagram too complicated.
- Activities might themselves have to be broken down into mini projects.

PERT:

Program (Project) Evaluation and Review Technique (PERT): is a project management tool used to schedule, organize, and coordinate tasks within a project. It is basically a method to analyse the tasks involved in completing a given project, especially the time needed to complete each task, and to identify the minimum time needed to complete the total project.

Difference between CPM and PERT:

BASIS FOR COMPARISON	PERT	CPM
Meaning	PERT is a project management technique, used to manage uncertain activities of a project.	CPM is a statistical technique of project management that manages well defined activities of a project.
What is it?	A technique of planning and control of time.	A method to control cost and time.
Orientation	Event-oriented	Activity-oriented
Evolution	Evolved as Research & Development project	Evolved as Construction project
Model	Probabilistic Model	Deterministic Model
Focuses on	Time	Time-cost trade-off
Estimates	Three time estimates	One time estimate
Appropriate for	High precision time estimate	Reasonable time estimate
Management of	Unpredictable Activities	Predictable activities
Nature of jobs	Non-repetitive nature	Repetitive nature
Critical and Non-critical activities	No differentiation	Differentiated
Suitable for	Research and Development Project	Non-research projects like civil construction, ship building etc.

COMPARATIVE CHARACTERISTICS OF PERT AND CPM

PERT	CPM
4. For management of new projects	3. For management of repetitive projects.
5. Model under uncertainty	4. Model under certainty
6. Time	5. Time versus cost trade-off
7. Event oriented	6. Activity oriented.

Advantages

- PERT chart explicitly defines and makes visible dependencies (precedence relationships) between the work breakdown structure (commonly WBS) elements.
- PERT facilitates identification of the critical path and makes this visible.
- PERT facilitates identification of early start, late start, and slack for each activity.
- PERT provides for potentially reduced project duration due to better understanding of dependencies leading to improved overlapping of activities and tasks where feasible.
- The large amount of project data can be organized & presented in diagram for use in decision making.
- PERT can provide a probability of completing before a given time.

Disadvantages

- Here can be potentially hundreds or thousands of activities and individual dependency relationships.
- PERT is not easily scalable for smaller projects.

- The network charts tend to be large and unwieldy requiring several pages to print and requiring specially sized paper.
- The lack of a timeframe on most PERT/CPM charts makes it harder to show status although colours can help (e.g., specific colour for completed nodes).