



The aim of the editor is to alleviate the students' community by providing the hand book at a modicum cost. This initiative is made to provide a study material for reference and to refresh their gained knowledge which was induced by the teachers.

This hand book is a reference copy covering the basics and not the proficiency in the

subject. I take this opportunity to thank the authors of various books in the same title for helping me in seeking the references.

Your suggestions and feedbacks are welcome as they will help in further enhancing the content. If the reader feels that, the efforts are to be appreciated then I would like to share and thank **Mr. J. P. Jaideep**, Head, BBA, for providing such a platform to embellish the skills of the faculties and students, I also thank **Mr. K. Sarvasvaran**, for documenting the notes which took a form of a handbook.

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PRODUCTION MANAGEMENT

- Hand Book

'One should not think they can make better products, instead they should know how to create the best product' - P.J.

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UNIT I

PRODUCTION MANAGEMENT

Conversion of raw material into finished goods is called as production

WHY TO STUDY:

1. Important function.
2. To know about goods to service.
3. To understand the problem of managers.
4. Cost reduction.
5. Improve it services.

PRODUCTION AS AN ORGANISATION FUNCTION

- Marketing.
- Production.
- Finance.
- Human Resource

Production as Conversion / Transformation Process:

INPUTS	Conversion Process	OUTPUT	
Prod System	Inputs	Conversion Process	Outputs
Steel plants	Iron Ore	Rolling	Smelting Sheets
Restaurant	Labor	Machine Cooking	Customer satisfied
College	Student, Teacher	Teaching	Graduates

Production As Means Of Creating Utility:

- ❖ Forms - Woods to furniture.
- ❖ Place - Iron Ores to Mines (Transformation).
- ❖ Times - Preservation (Warehousing).
- ❖ Possession - Ownership.
- ❖ Service - Rendering Service.
- ❖ Knowledge - Advertisement.

Production Function:

Production Function may be defined as creation of useful products for sale with the help of input such as Material, Machine and money, maintenance mgt. It's relationship between Inputs and Outputs.

Production = Output/Input, known as efficiency of Production Process.

Importance of Production Management

- Employment more than 50%.
- Without production no other functions.
- Creation of goods and services.

Advantage of PM. Management:

- ❖ Shorter new product lead time.
- ❖ Higher inventory Turnover.
- ❖ Shorter cycle time.
- ❖ Higher product quality.
- ❖ Greater flexibility.
- ❖ Better customer services.
- ❖ Reduce wastage.
- ❖ Higher productivity (reduced cost).

OBJECTIVES OF PRODUCTION MANAGEMENT:

Customer satisfaction through quality, cost, delivery time ,reliability.

- ✓ Minimum scrap.
- ✓ Maximum utilization of resources.
- ✓ Maximum employee satisfaction.
- ✓ Maximum possible production.
- ✓ Higher operating efficiency.
- ✓ Minimum cycle time.
- ✓ Maximum return on investment.
- ✓ Protection of environment.
- ✓ Minimum possible inventory.

RESPONSIBILITIES OF PRODUCTION MANAGERS:

- ✓ Meeting requirements of quality demanded by customers.
- ✓ Establishing realistic delivery.
- ✓ Producing required volume.
- ✓ Selection & application of most economic methods.
- ✓ Controlling cost of input & conversion process.
- ✓ Responsible for 5 p's: Product, plan, process, program, people.
- ✓ Consider layouts of buildings.

PLANT:

- ✓ Maintenance of machine.
- ✓ Performance of machine.
- ✓ Safety installation.
- ✓ Environment protection.

PROCESS:

- 1) Available capacity.
- 2) Available labour.
- 3) Type of production.
- 4) Cost to be achieved.
- 5) Layout of plant.

PROGRAM:

1. Time table or schedules
2. Delivery
3. Service to customer
4. Manufacture
5. Assembling
6. Packaging
7. Dispatching

PEOPLE:

- 1) Skill
- 2) Knowledge
- 3) Intelligence
- 4) Effective utilization of resource

PRODUCT:

1. Performance
2. Quality
3. Reliability
4. Selling price

Production System

Production system is the frame works within the conversion of inputs into outputs occurs and one end of production. There are no inputs and at the other outputs. Inputs and outputs are linked by certain operations or process which

impart the value is input and such an operation is called as Transformation process.

Types of production System

There are fundamentally two types of production system:

- Continuous system
- Intermediary System
- ❖ **Continuous system**
 - ✓ Mass Production
 - ✓ Process – Anatical, Synthetic
 - ✓ Assembly
- ❖ **Intermediary System**
 - ✓ Job
 - ✓ Batch.

1. Continuous System

Continuous Production system involves continuous physical flow of materials, it make use of special process of machine and produces standard items in large quantities.

Example: Petrol, Chemical, Cement, Steel, Sugar etc..

In this system the items are produced for stock and not for specific orders before planning and manufacturing to stock, sales forecast is made to estimate the likely demand of product and a master schedule is prepared adjust the sales forecast based on passed orders and level of inventory.

Types of Continuous Function

There are three types of continuous function

1. Mass production.
2. Process production.
3. Assembly production.

Mass Production: Here only one type of product or maximum of 2 or 3 products are manufactured in large quantities standard of products, process, materials, machines are interpreted flow of materials in the system.

Example:- Automobiles (Ashok Leyland) electronics.

Process Production: This system is used for the manufactures of the items whose demand is continuous and high. Here raw material can be transformed into different product at different manufacturing stages.

Example - Crude oil in refinery at different stages.

Assembling Production: Here two or more components are combining to manufacture finished products. Manufactured parts are joined into assemblies and final assemblies. Such processes are employed in assembling.

1. Automobiles
2. TV
3. Bicycles

2. Intermediary System

In this system the goods are manufactured specially to fulfill the orders placed by the customer rather than to shop. Here the flow of method is intermediated. Eg: Construction of bridges.

Job or Unit Production: It is the product of single complete unit by one operator or group of operators.

Batch Production: The item are processed in lot on batchers and a new batch is undertaken for all the items of the production (previous batches) is completed. Thus the batch production is the moisture of mass production and job production.

Example:- Production of tools, printing press.etc.

Productivity:

Productivity is a crucial element to the welfare of the industrial firms as well as for the economic progress of the country. if productivity is more and the quality of the product produced is of high standards than the demand for the product will be high in global market.

$$\text{Total productivity} = \frac{\text{Goods and Resources Produced}}{\text{Outputs Labour} + \text{Material} + \text{Capital}}$$

$$\text{Product productivity} = \frac{\text{credit services produced}}{\text{outputs labour hours}}$$

Productivity can be increased by following ways:

- ❖ Increase the output using the same input.
- ❖ Reducing the input keeping the output constant.
- ❖ Increasing the output to a larger extent and small increase in input.

Objectives of production system:

1. **Quality:** The quality of a product is established based upon their customer's needs. Customer's need are translated into product specification by their design.
2. **Manufacturing:** Department then may translate this specification into measurable objectives. Thus the cost quality trade off bridges the final quality of the product.
3. **Quantity:** If the product are produced in excess quantities the capital will block off in the two form of inventory and if there is quantity short of demand there will be shortage of products. Thus a decision to be taken regarding how much to be produce.
4. **Manufacturing Cost:** It is established before the product actually manufactured. It has to manufacture the product at the pre established cost in any case any variation between the actual cost. The standard should be kept in mind.
5. **Manufacturing Schedule:** Timeliness of delivery is one of the important parameters to judge the effectiveness of production department. There are many reasons like non-availability of raw materials at the right time machine break down etc. So the manufacturing department should organize its activities in such a way that the product will be manufactured as per schedule.

Relationship with other functional areas

Production and Marketing

- | | |
|--------------------------|--------------------------|
| 1. Demand forecasting | 4. New product idea |
| 2. Delivery requirements | 5. Product acceptability |
| 3. Modifications | |

As production function has the most direct and intimate relationship with the marketing function, several decisions in production and marketing are based on common premises and inputs. Product design, size, quality, have to be determined keeping in the view the needs of customers. Marketing department

should also consult with the production department while eliminating slow moving products. Despite close interrelationship and interdependence, there is lack of coordination. Marketing personnel prefer a wide variety products, introduction of new products are the main area of conflict.

Production and Finance

Capital Budget: There is a limited amount of capital available.

Marginal Analysis: This often applies to the screening of new product.

Standard Cost: There are predetermined costs which are calculated in advance of production but which are expected to be compared with actual cost incurred during production.

Production budget: Labour, material, overhead are compared with monetary targets. The comparison of the actual cost against the budget cost leads to performance appraisal.

Production costing: Production cost can be calculated for job, batch, and mass production. These include machine setting, transportation inspection.

Production and Human Resource

- ✓ Analysis of labour supply.
- ✓ Procedure for man power requirements.
- ✓ Formation of industrial relation policy is necessary for effective work, disciplinary methods and dismissal procedure.
- ✓ Analyzing effective use of H.R.
- ✓ Necessary to maintain adequate level of motivation.

Problems of Production Management

- ❖ Problems of plant location.
- ❖ Problems of plant layout. (heating, lighting)
- ❖ Problems of product design. (economic order quantity)
- ❖ Problems of quality control. (product inspection, statistical quality)
- ❖ Problems of labour control. (wages)
- ❖ Problems of cost control. (maximum production at minimum cost)
- ❖ Problems regarding socio-economic environment.

UNIT-2

PRODUCTION PLANNING AND CONTROL

Gordon B. Carson "Production planning and control consists of the organisation and the planning of the manufacturing process routing, scheduling, dispatching and inspection, co-ordination and control of the machine, method, material, tooling and operating time. The ultimate objective is the organisation of supply and movement of material, labour and machine utilisation and related activities in order to bring about the desired manufacturing results in terms of quality, time, price".

Main elements of production planning and control:

1. Routing
2. Scheduling
3. Loading
4. Despatching
5. Follow up.

Objectives of Production Planning & Control:

- ❖ Quality of output.
- ❖ Plant utilisation.
- ❖ Process efficiency.
- ❖ Delivery of goods.
- ❖ Maintenance of inventory.
- ❖ Flexibility.
- ❖ Effectiveness of work.
- ❖ Absenteeism.
- ❖ Team spirit.
- ❖ Ideas for new methods.
- ❖ Reduced supervision.
- ❖ Reduced waiting time.

Functions of Production Planning & Control:

1. **Materials:** More available in required quantities and at required time to ensure correct beginning & end resulting in uninterrupted production. This function includes specification of materials, delivery time, buying decisions.
2. **Methods:** Analysis the alternative and select the best method.
3. **Man Power:** Maintaining the availability of appropriate man power on appropriate machines at the right time.
4. **Process Planning (Routing):**
 - ❖ Fixation of path of travel.
 - ❖ Deciding time setup and process time for each operation.
 - ❖ Selecting the path route which the raw material should follow to get transferred into finished products.

5. **Estimating:** Once the overall method and sequence of operations are fixed and process sheet for each process is available, then the operation times are estimating using work measure technically.
6. **Loading and scheduling:**
 - ❖ Loading the machine as per the capability and capacity.
 - ❖ Determine the starting and completion time for each operation.
 - ❖ To coordinate with sales dept. regarding delivery schedules.
7. **Dispatching:**
 - ❖ To assign definite work to a particular machine, workcentres and man.
 - ❖ To issue required materials from stores.
 - ❖ To release necessary work orders, time tickets.
 - ❖ To record start and finish time of each job.
8. **Expediting (Organizes Journey):**
 - ❖ Identification of bottle necks.
 - ❖ To device action plans (remedies) for rectifying the errors.
 - ❖ To ensure production rates are in line with schedule.
9. **Inspection:** It is the major control tools. It is important to production planning to control both for the execution of the current plans and its scope for future planning.
10. **Evaluation:** A thorough analysis of all the factors influencing the production planning and control helps to identify the weak spots and the corrective actions with respect to pre-planning and planning. The success of this step depends upon communication, data, information gathering and analysis.

Stages of production planning and controlling:

1. **Pre-planning:** This is the aspect of planning which is concerned with analysis of data, sales report, market research new process and material, layout and workflow. The data collection is based on 9m's man, money, material, method, machines, monrot, math, minutes and milieu (activities).
2. **Planning:** It is the thorough analysis of 9m's which includes routing estimating and scheduling the more detailed realistic and precised planning subsequently leads to greater efficiency of the plant, there are two aspects of planning.

- ❖ Short term (concerned with immediate production program)
- ❖ Long-term (plans for future).

Prominent planning deals with standardization and simplification of products and methods.

3. **Control:** Final evaluation takes place to complete production planning. If it controls inventories, scrap, transportation, dispatching and expediting, the control function have important role providing man sources of feedback information to ensure necessary corrective actions, effective communication systems are the requisites to efficient controlling. Once the man policy is designed by the management production plan & control in the director and co-coordinator for the complete planning.

Centralization & Decentralization Production Planning & Control:

Centralization Planning Is Done By Special Staff And It Takes Away The Burden Of Planning Which Allow To concentrate More On Manufacturing. Decentralized Planning Involves More Staff And It Takes Away Much Of The Time Performing Other Functions. Higher Degree Of Centralization Is Recommend For Large Workforce That Produce Multi Production And Has Multiple Plans Low Degree Of Concentration Is Preferred For Small Workforce.

Production Planning And Control An Integrated Function:

Production Planning And Control Is A Staff Function Where Necessary Ensures Co-Operation From All Departments E.g. Sales Department, Design Department, Quality Control Department, Maintenance Department, Stores Department Etc...And That Is Why It Is Looked Upon An On Integrated Functions. The Effectiveness Cannot Be Fulfilled With Reflections Like Wastage Of Labour & Material, Lower Investment, Low Cost Of Production. Ignorance & Lack Of Production

Sales Department:

- ✓ It Should Have Timely Communication between Sales And Production.
- ✓ Sales Must Consult Production Planning At The Earliest.
- ✓ Get The Exact Delivery Schedule From Production Planning & Control.

- ✓ Production Planning & Control Should Provide Correct Status Of Progress To Sales.
- ✓ Production Planning & Control Should Report About Inability To Deliver or delay Of Delivery.
- ✓ Sales Department Should Not Accept Order Without Consulting Production Planning And Control.
- ✓ Buyers Feed Back Must Be Passed On To Production Planning And Control.

Design Department:

- Design Department Must Design The Machine To The Maximum Capacity.
- Design Changes Should Be Informed To Production Planning & Control.
- Design Can Be Reviewed For The Reliability Of The Product.

Inspection And Quality Control Department:

- ❖ Inspection department should provide immediate feedback about rejected goods.
- ❖ The first few pieces of the product should be inspected and conveyed immediately to p.p.c.
- ❖ Inspection of job is prior.
- ❖ Inspection must also look for loss due to discontinuous flow of material.
- ❖ Quality control should decide the inspection tools.

Purchase And Stores Department:

- ✓ Should get advance information on the raw material and tools that require to be purchase by the schedule start.
- ✓ Purchase department must keep p.p.c abreast(side by side) of the market situation.
- ✓ Should initiate the immediate action on revised schedules.

Stores Department:

- Ensuring that sufficient stock of tools, raw materials are maintained.
- Maintain stores record accurately.
- Ensure stores shown in stock card and the physical stock should tally.

Maintenance Department:

- ✓ Attending on the machines in vital and essential categories.

Personnel Department:

- ❖ Information about leave, resignation, refreshment (spending less money) hiring etc...
- ❖ Notification received from EB pertaining to the period of power cuts etc.

Benefits of Routing:

1. Efficient use of available resources.
2. Reduction in manufacturing costs.
3. Improvement in quality.
4. Providing a basis for scheduling and loading.

PRODUCTION PLANNING AND PRODUCTION CONTROL

S. No.	Production Planning	Production Control
1.	Production Planning is a Pre production activity	Production Control is set in motion when production activity begins
2.	Involves collection maintenance analysis of date, Material, Machine and process capabilities	control is concerned with communication, productivity rejection rates etc.,
3.	Useful to anticipate the problem and devising removal measure.	Control involves in taking corrective steps in case of errors
4.	Planning is the controlled activity	Control is a Wide greed activity
5.	Production does that all the Necessary resource are available to make production at right quality and time.	Control Keeps track of the activities and ensures whether everything is Processing as per schedule or not.

Routing:

This is a process of deterring the sequence of operation to be performed in production process, Routing determines what work must be done, where, how? It is useful to prepare machine loading charts and schedules.

Route Sheet: Contains the following information

- ❖ The Operation required and their desired sequence.
- ❖ Machine or equipment to be used for each operation.
- ❖ Estimate set up time and operation time.
- ❖ Tools required for operation.
- ❖ Specification of raw materials to be used.
- ❖ Specification of dimension, tolerance, surface finish and qualification to be achieved
- ❖ Packaging and handling instructions.

Scheduling:

Scheduling functions ensures that the "right things" are done at the "right time" with "right machine" and tools or right people to create the product through most efficient utilization of resources.

Objectives:

- To have maximum utilization of men, money and material.
- To prevent unbalanced use of time among departments.
- To complete production at minimum total cost.
- To reduce manufacturing cycle time.
- To deliver products in time.
- To eliminate idling of men and machine.

Elements:

- **Demand forecast:** Long range forecast or short range forecast.
- **Production plan:** Resource request, capacity limitation and inventory levels.
- **Priority plan.**
- **Master production schedule:** Quarterly, full year.
- **Capacity planning:** Machine hour and labour hour.
- **Evaluation of work load:** Excess work load transferred to other centers.
- **Sequencing:** Maximise work flow through work centers.

DISPATCHING:

- ✓ Issuing shop orders or job cards to the production department.

- ✓ Collecting tools from tool stores, raw materials from raw material stores.
- ✓ Issuing drawings, specifications, route cards to time tickets.
- ✓ Obtaining inspection schedule.
- ✓ Returning tools to the tool departments.
- ✓ Recording the beginning & completing the work.
- ✓ Recording and reporting idle time of machine and labour.

Dispatching may be defined as setting production activities in motion through the release of orders and instructions in accordance with the previously planned time schedule.

Dispatching is the implementation function which is concerned with getting the work started on the shop floors. It ensures that schedules and machine loading charts are properly implemented as planned. The following functions are followed by dispatching section.

UNIT III

MAINTENANCE MANAGEMENT

Maintenance is defined as "the function of production Management is concerned with the day to day problem of keeping the physical plant in good operating condition. It is an essential activity in every manufacturing firm because it is necessary to ensure the availability of machine, building and service needed by other parts of the organization for the performance of their function at an optimum return on investment in machines, materials and employees". Two broad categories of Primary Function & Secondary function are

Primary Function:

- Maintenance of existing plant & equipment.
- Maintenance of existing building & ground.
- Equipment inspection and lubrication.
- Alteration of existing equipment & buildings.
- New installation of equipments & buildings.

Secondary Function:

- ✓ Store keeping (keeping stock of spares parts).
- ✓ Fire protection.
- ✓ Waste disposed.
- ✓ Insurance administration.
- ✓ Janitorial services.
- ✓ Property accounting.
- ✓ Pollution and noise control.

Impact of poor maintenance

- ❖ **Production capacity:** Idle machine can't produce "plant capacity condition"
- ❖ **Production cost:** Machine break down - Labour paid for not working
- ❖ **Product & Service quality:** Air craft fleet
- ❖ **Employee (or) customer safety:** Labour welfare not assured
- ❖ **Customer satisfaction:** Late delivery due to poor

Objective of maintenance management:

- 1) Minimizing the loss of productive time because of equip failure.
- 2) Minimizing the repair time & repair cost.
- 3) Efficient use of maintenance of equipment.
- 4) To keep all productive assets in good working condition.
- 5) To maximize efficiency & economy in production.
- 6) To minimize accidents through regular inspection.
- 7) To minimize the total maintenance cost which includes cost of repairs.
- 8) To improve the quality of products & to improve productivity.

Areas of maintenance:

1. **Civil:** Building, water, steam, gas, air, plumbing, carpenter, housekeeping, fencing, drion, lawn, fire.
2. **Mechanical:** Vehicle, generator, equips, boilers, furnace (lubrication)
3. **Electrical:** GG, transform, light, fans, ,meter ,batteries, motors Etc;

TYPES OF MAINTENANCE

Break Down maintenance:

Repairs are made after the equipment is out of order.

Example: An Electric motor will not start.

A conveyer belt is ripped. (Getting torn)

A shaft has broken.

In such cases the maintenance department checks into the difficulty and moves the necessary repairs.

1. To get equipment back into operation as quickly as possible.
2. To control the cost of repair crew.
3. To control the cost of the operation of repair shops.
4. To control the investment in replacement of spare parts.
5. The decision about how far to go with repair rages from a band aid and a bubble gum fix to complete overhand.

Preventive Maintenance:

Preventive Maintenance is undertaken before the need arises and aims to minimize the possibility of unanticipated production interruption.

Preventive Maintenance consists of:

- ✓ Proper design and installation of equipment.
- ✓ Repetitive servicing. Overhead of equipment.
- ✓ Adequate lubrication, cleaning and painting the building and equipment.
- ✓ Use check list by inspectors.
- ✓ An inspection frequency schedule.
- ✓ Well qualified inspectors.

BENEFITS:

It offers several benefits to the user. They include greater safety for workers, decreased production down time, faster large scale and repetitive repairs, less cost for simple repair made by breakdown, loss stand by equipment required, better spare parts control.

ROUTINE MAINTENANCE:

This includes activities such as periodic inspection, cleaning lubrication and repair of production equipment after their service life.

- 1) **Running Maintenance:** The maintenance work is carried out while the equipment is in the operating condition (example greasing or lubricating the bearing.)
- 2) **Shut Down Maintenance:** The maintenance work is carried out when the machinery is out of service (example repairs, tubes of boilers

Maintenance scheduling

Maintenance scheduling indicates what maintenance work has to be carried out and also in what sequence the work has to be done.

Reasons for maintenance scheduling:

- ✓ To utilize the maintenance crew efficiently.
- ✓ To utilize the maintenance equipment and tools effectively.
- ✓ To reduce interruption in production due to maintenance work.
- ✓ Proper schedule of preventive maintenance reduces the abrupt break down and failure of machinery.

Machinery scheduling must consider about

- ❖ Manpower availability

- ❖ Pending machine work
- ❖ Availability of machine for preventive maintenance
- ❖ Availability of proper tools, spare parts, etc
- ❖ Availability of special maintenance equipment, special fixtures
- ❖ when to start the maintenance work
- ❖ Previous maintenance history, record, charts

Problems in maintenance scheduling

1. Maintenance scheduling requires the prior con-current of production personnel to release the machine. Hence proper co-operation must be maintained between production department and maintenance department.
2. Proper priority must be warned out to prepare scheduling of breakdown maintenance and prevent maintenance as per the importance of machine.
3. Dovetailing of maintenance and production schedule is difficult.
4. Preventive maintenance schedule must be prepared for at least two weeks by and circulated well in advance to production department to get their consent by finalizing the schedule.

Time Schedule for Maintenance Activities:

Time Scheduling	Maintenance Activity	Sources of Information
Long-term	Lubrication	Manufacturer's recommendations
Short - Term	1. Preventive Maintenance inspection	Technical experience and Maintenance manual
	2. Overhauling	Machine history Manual
	3. Cleaning	Maintenance Manual
	4. Replacement of machine	Techno-economic evaluation or accuracy
	5. Repairs	Inspection reports
	6. Replacement of parts	1. Complaints of breakdown 2. Analysis of history of breakdown

UNIT IV PLANT LOCATION

Introduction:

All firms need to address the location decision because location greatly affects both fixed and variable cost, the selling price also increases as much as 25% of transportation cost, wages, taxes, rent, etc..

Definition: According to me Kinsey "location ultimately has the power to make or break a company's business strategy".

Need For Selecting a Suitable Location:

Often many organization face the problem of choosing a proper location the reasons for making location decisions are:

- ✓ A new business is started.
- ✓ when a business firm wants to expand its existing system.
- ✓ when an organization is not able to expand in the existing location to meet the demand.
- ✓ Some firm relocate due to rise in the cost of distribution, fuel, etc.
- ✓ Shift in market.
- ✓ Shortage of labor, electricity, change.

Plant Location Problems:

Deciding on domestic (or) international location

- ❖ Globalization.
- ❖ Competitive advantages.
- ❖ Export and import quotas.
- ❖ Availability of natural resources.

Regional Location Decisions:

1. Availability of raw materials:-
 - ✓ To reduce transportation cost.
2. Nearness to the market:-
 - ✓ For non-durable items (flower).
3. Proximity to suppliers:-
 - ✓ Supplying bulk materials.

4. Availability of power:-
 - ✓ Adequate supply of power in cheaper rate.
5. Transport facility:-
 - ✓ Well connect to rail, road, sea, air.
6. Suitability of climate:-
 - ✓ For example:-cotton, jute, etc. for marketing.
7. Government policy:-
 - ✓ Central government influence the finance, subsidies, licensing, and policies in backward states (rural areas).
8. Competition between states:-
 - ✓ Cheaper power, land, sales tax, labour etc.

Selection of Community:

1. Availability of labour:-
 - Attitude of labour (Union, labour, etc to be avoided).
 - Skilled labour (Some avoid skilled, they may move out of the firm.
2. Civic Amenities for Employees:
 - Medical, Education, Recruitment etc.
3. Existence of Complimentary, Ancillary & Competing:
 - Complimentary Ancillary – Helps in job orders, sub contracts.
 - Competing – More encouragement so that jointly they can tackle raw material problems.
4. Finance and Research Facilities:
 - Located near Banks & Financial Institutions.
 - Should be located near research institutions.
5. Availability of water.
6. Availability of firefighting.

Selection of Exact Site:

1. Nature of soil (Topography).
2. Removal of Waste.
3. Community (Should not have negative attitude).

Advantages of Rural:

1. Land rate is cheaper.
2. Taxes are negligible.

3. Labour is cheaper.
4. Absence of labour problems.
5. Less municipal restrictions.

Advantages of Urban:

1. Good Transportation.
2. Availability Of Skilled Labour.
3. Availability Of Civic Amenities.
4. Availability Of Banking Facilities.
5. Availability Of Complementary And Ancillary Industries.
6. Large Local Markets Are Present.
7. Availability Of Water Power Etc.
8. Availability Of Education Institution To Train Employees.

Advantages of Semi Urban:

- ✓ They offer a compromise between urban and rural sites have advantages of both urban and rural sites.

Factors Affecting Plant Location:

1. Should Be Profit Oriented.
2. Should Be Accepted By Employee.
3. Should Not Have High Operation Cost.
4. It Should Involve Long Term Commitment.
5. Non Profit Organisation Should Balance Between Cost And Customer Services.
6. Should Develop Location Alternatives.
7. Should Decide On Criteria Such As Increased Revenues Etc.

PLANT LAYOUT:

Definition:

"Plant layout or facility layout means planning for location of all machines, utilities, ware stations, tools. Service area, storage area, lunch rooms, rest rooms, computer rooms and also planning for the flow of material & people around"

OBJECTIVES & IMPORTANCE:

1. High utilization of space, equipments & people.

2. Improve flow of material, people and safe working conditions.
3. Higher flexibility.
4. Reduced handling cost & congestion.
5. Reduced health regards & accidents.
6. Reduced idle time of labour & equipments.
7. To provide ease of supervision, product flexibility
8. To facilitate better co-ordination, communication and maintenance.
9. To utilize space efficiently to improve the productivity.

PRINCIPLES:

The layout selected should be guided by certain principles, they are,

- The principle of minimum travels (To minimize the loss of material handling).
- Principle of usage (To utilize product layout).
- Principle of compactness (To use the available space efficiently).
- Principle of safety satisfaction (To satisfy workmen & ensure safety).
- Principle of minimum investment (To save the Capital).

Factors Influencing Layout Choices:

1. **Materials:**
 - Should include provision for storage.
 - Should have space for handling equipments like trolley, cranes, etc.
2. **Product:**
 - Should consider the type of product. (i.e.) heavy, big, small, liquid or solid etc..
 - Process equipment and machines used are largely dependent upon (Example) scooter, soaps etc.
3. **Workers:**
 - The gender of the employees should be considered.
 - The facilities like restrooms, canteens, lockers, etc., should be provided.
4. **Machines:** The type of machine should be considered for layout.
5. **Type of Industry:**
 - Industries are classified as
 - 1) Synthetic
 - 2) Analytical
 - 3) Conditional
 - 4) Extraction.
 - Based on this layout should be formed.

6. **Location:**
 - Mode of transportation. (Ship, Truck, Trains)
 - Type of transportation should be considered. (Container) raw material, (tank) fuel.
7. **Management Policies:**
 - Future expansion.
 - Volume of production.

Types of Layout:

A layout essentially refers to arranging and grouping of machines to produce goods. The methods of grouping are:

1. **Process Layout or Functional Layout:** It is called a functional layout which involves grouping of similar machines in one department, thus the material can be transported easily from one department to the other, and work has to be allotted to each department in such a way that no machine is idle in any department. The process layout carries out the functional idea of Taylor and from the historical point of view process layout precedes product layout.

Advantages	Disadvantages
Reduced Investment	Requires More Floor Space Work In Progress Has To Travel From Place To Place
Greater Flexibility	
Better Efficient Supervision	
Great Scope For Expansion	
Better Utilization Of Men and Equipments	
Easy To Handle Machines	
Great Incentives To Individual Worker	
Lower Investment On Equipment	

2. **Product Layout:** This emphasizes more on special purpose machines therefore investment on machine is higher. This involves arrangement of machine in one line depending upon the sequence of operation the output of one machine becomes the input for the next machine. All the operational including texting, packing, should be included. There should be no point where one line crosses the other line. The product layout is used in manufacturing chemical, sugar, rubber, etc.

Advantages:

- Reduction in material handling cost.
- Economy in manufacturing time.
- Facilitates better production centre.
- Avoids production bottle necks.
- Requires less floor area per unit of production
- Work in progress is reduced.
- Minimum investment.
- Early reduction in mistakes.
- Greater incentives to group of women

Disadvantages:

- Expansion is difficult.
- Separation is difficult.
- Less facility.
- More expensive.
- Any breakdown might disrupt the whole system.

3. **Fixed Position Layout:** This type of layout involves the movement of machines and men where the product is stationary. It is also called as static layout. This includes manufacturers of ships, aircrafts, construction of buildings, hospitals etc.

<i>Hospital:</i>	Doctors and Nurses are	WORKERS
	Medicines are	MATERIAL
	Patients are	PRODUCE

Advantages:

- Men and machine can be used for a wide variety of operations.
- Investment is small.
- Workers take pride in completing the work.
- No difficulty of transportation.

4. **Cellular Manufacturing Layout:** This function is somewhat like a product layout within a process layout. The flow of parts within cells takes many turns

- Some cells make use of some machines in a line flow fashion

- Some cells take different routes for different products.

Advantages:

- Lower work in progress
- Simplified production planning
- Facilities quicker steps, in-process on-time delivery
- Reduce material handling
- Improved visual control.

Disadvantages:

- Increased machine downtime
- Reduce manufacturing flexibility
- Duplicate pieces of equipment may be needed to avoid transportation between cells.

5. **Combined Layouts:** It applies the principles of product layout, process layout and fixed position layout. Emphasis is noticed in industrial establishments.

Example: In soap manufacturing plant the machinery manufacturing soap is on product layout principle.

6. **Process Layout:** Ancillary service such as manufacturing of glycerin, water treatment plant, heating etc., rearranged on process layout.

The workers are brought from different places and the tools & materials are carried to the places of manufacturing. All these refer to fixed position layout.

This concludes marketing is concerned with maximum income that there is sufficient difference from other products.

7. **Service Facility Layout:** The fundamental difference is that it brings together customer and service; it provides

1. Easy entrance
2. Parking
3. Well designed walk ways etc.

Example: Banks, hospital, college, schools etc. These are mostly designed around customer servicing function.

Characteristics of a Good Layout:

1. Smooth flow of production.

2. Maximum utilization of space.
3. Minimum material handling.
4. Smooth movement of men and machinery from place to place.
5. Good working condition (lighting, ventilation, temperature).
6. Flexibility for change or expansion of layout.
7. Proper storage area and supervision.
8. Effective coordination.
9. Maximum output.
10. Provision of safety.

Characteristics of a Bad Layout:

1. Congestion of material.
2. Poor utilization of space.
3. Excessive work in progress.
4. Excessive maintenance time and cost.
5. Delay in delivery.
6. Difficulty in supervision.
7. Excessive handling cost, storage cost, transportation cost.
8. Long production cycle time.
9. Excessive damage during transportation.
10. Low productivity due to more of men and machine.

WORK STUDY

Definition:

Work Study is defined as that body of knowledge concerned with the analysis of the work methods and the equipments used for performing the job. The design of an optimum work method and the standardization of proposed work methods.

Importance of Work Study:

It is necessary that the employees work harder to be more productive so that they can meet global competition. In this direction improving labour productivity and reducing cost by improving and simplifying work methods needs special attention by operation managers. To facilitate this, work study technique has been developed over a period of time.

Objectives of Work Study:

1. To improve productivity and labour efficiency.
2. To enable optimal utilization of equipments.
3. To increase job standardization.
4. To evaluate human effort.
5. To determine better methods of doing the job.
6. To standardise the method to establish standard time for the job.

Work Study Procedures:

1. Select the job.
2. Record all relevant facts about the job.
3. Examine critically by questioning the purpose, place and person doing the job.
4. Develop the new method of the job.
5. Measure the work content and establish standard time.
6. Define the new method.
7. Install the new method as practice.
8. Maintain the new method of job.

TIME STUDY

Meaning:

Time study is concerned with the determination of the amount of time required to perform a unit of work.

Definition:

ILO says "Time study is a work measurement technique for recording the time and rates of working for the elements of a specified job carried out under specified conditions and for analyzing the data. So as to obtain the time necessary for carrying out the job at a defined level of performance."

Objectives:

- To furnish a basis of comparison for determining operative effectiveness.
- To determine standard cost, equipments, labour, number of machines.
- To determine cycle time.
- To balance work of operators.
- To set completion schedule for individual job.

- To compare alternative methods in method study.
- To provide a basis for setting piece rate or wages.
- To set labour standard for satisfactory performance.

Human considerations in work study:

- ❖ One of the greatest problems is obtaining active Corporation amount the workers. Hence work study engineers must establish good relationship with workers, supervisors and managers.
- ❖ The Workers should not perceive a threat to their job security.
- ❖ They should not leave a wrong perception that benefits of higher productivity will not be shared by managements the presumption will result in non cooperation which will slow down the pace (speed) of the work.
- ❖ They should not thing that any change in the present situation is the interruption of their comfort ability.

METHOD STUDY

Meaning:

It is a scientific technique of observing recording and critically examining the present method of performing a job with the aim of improving the present method

Need For Method Analysis:

1. Changes in tool of equipment
2. Changes in product design
3. Changes in material or procedure
4. Quality problems ,safety for health hazard
5. Contracted agreements (or) govt. regulations

Objectives:

1. To study the existing method of doing any job
2. To develop an improved method
3. To reduce operation cost
4. To improve utilization of resources
5. To eliminate wasteful and inefficient motions

Advantages:

1. Warm simplification
2. Improved warming method (cheaper method)
3. Better product quality
4. Improved work place layout
5. Improved equipment design
6. Better warming conditions
7. Better material handling
8. Reduced cost
9. Improved work flow
10. Less fatigue (tiredness) to the workless
11. Optimum utilization of all resources
12. Higher safety to work maximization
13. Shorter production cycle time.
14. Higher job satisfaction.
15. Reduced material consumption and wastages.
16. Reduced manufacturing cost and higher productivity.

Factors Facilitating Method Study

[Why to Have Method Study, Under What Situation Method study Needs]

1. High operating cost.
2. High wastage and scrap
3. Excessive movement of material and workmen.
4. Excessive production bottlenecks
5. Excessive rejection and rework.
6. Complaints about quality.
7. Complaints about poor working conditions.
8. Increasing number of accidents.
9. Excessive use of over time.

Steps Involved In Method Study:

Select: the work or job to be studied.

Record: all the relevant facts.

Examine: the recorded facts critically challenging everything being done

Develop: the improved method by generating several alternative and selecting the best method

- To compare alternative methods in method study.
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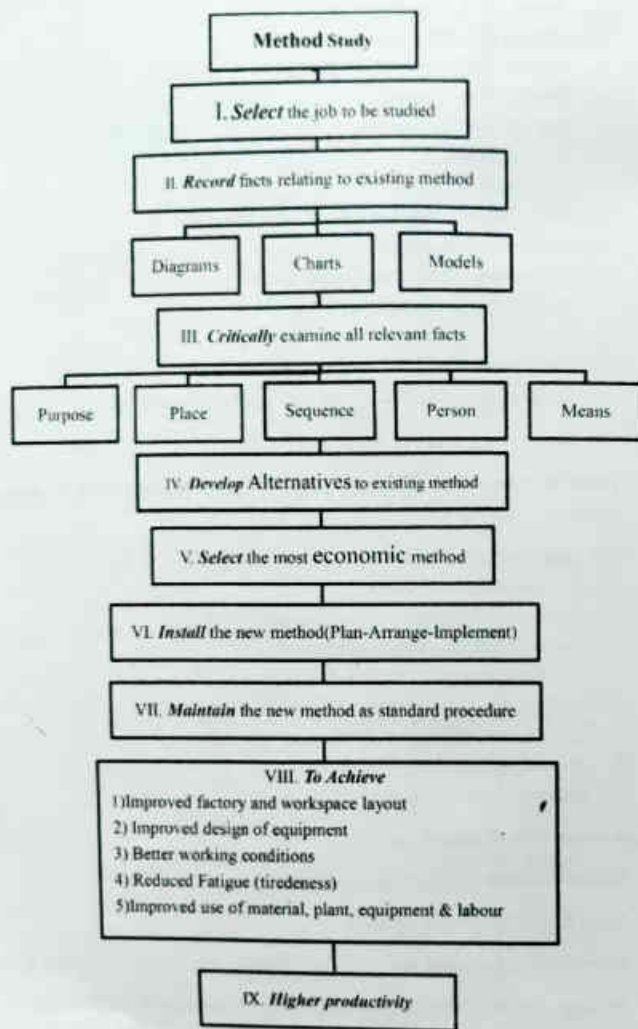
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Steps in Method Study Chart



Best Methods [Factors To Be Considered]

1. Cost of implementation.
2. Expected saving in time and cost.
3. Flexibility
4. Producability
5. Acceptance to design production, planning and control.
6. Reaction of the employees to the new method.
7. Short term or long term implication of the alternative.

Install: The improved method in three phases

- Planning
- Arranging
- Implementing

Maintaining: The new method by ensuring it functions well

Recording techniques used in method study:

- 1) **Process chart:**
 - a) Outline process chart
 - b) Operation process chart
 - c) Flow process chart – material type, man type, muslin type, equipment type
 - d) Man machine chart
 - e) Two handled process chart
 - f) Multiple activity chart
 - g) Simultaneous motion chart (simo chart)
 - h) Motion chart
 - i) Film analysis chart
- 2) **Diagrams:**
 - Flow chart
 - String diagram
 - Cycle diagram
 - Chronocycle graph.

1. **Outline Process Chart:** It records an overall picture of the process and records only the main events sequence-wise. It considers only the main operations and inspections.

2. **Operation Process Chart:** This is a basic process chart with graphic representation of points at which the materials are introduced and the sequence of inspection in all operations except material handling. (For example) WHEEL - No. of operations 3 + No. of inspection 2 = (Total activities 5)

- a) Turn the cast iron round
- b) Drill one hole
- c) Inspection of dimensions
- d) Execute a lot of 12 mm width
- e) Inspect the hole to pay slot.

3. **Flow Process Chart:** There are graphic representation off all operations , transportation , inspection, delays, storage, and include information such as time required to distance moved.

It could be of three types

- ❖ Based on the product type
- ❖ Based on the man type
- ❖ Based on the equipment

4. **Two Handed Process Chart:** The worker's activities are recorded chronographically (shown in order in which they happen) based on his both hands. For example: Bolt-Nut-Washers

5. **Multiple Activity Charts:** Activities of more than one subject (workers, machine, equipment) are recorded on a common time.

For example: Coffee maker + man + customer

6. **Man Machine Chart:** This is multiple activity charts which also illustrate operations and delays of the operator and the machine which he operates.

For example: One worker running two machines.

7. **Simu Chart:** It's a type of two handed process in which micro motions of both the hands are recorded.

8. **Flow Diagram:** It is drawn to show relative position of the machine jigs fixtures shows the path followed by material or machine.

9. **String Diagram:** It is a plan or model on which a string is used to trace the path of workers, material, during a special sequence of event.

UNIT - 5

TQM (TOTAL QUALITY MANAGEMENT)

Quality is considered as a byproduct of manufacturing system, each individual process has some variation that will lead to the production of some defective pieces. If the resulting defective rate is too high, the product will be sent for rework & this approach is expensive and it leads to responsibility of the quality control manager to inspect for a quality products.

The quality emphasis the quality of the product by studying and improving activities that affect quality from marketing or manufacturing. This new approach is referred to as TQM. It is an active approach encompassing company wide quality. It demands co-operation from every one.

TQM own its origin to two Americans W. EDWARDS DEMING, J.M JURAN. They first launched it in Japan which was rebuilt by world war 2. Juran defined quality as fitness for use. Juran felt managers to workers should concentrate their efforts where it really mattered.

Deming believe the manager's job is to see out and correct the cause of failure after they occur. (BEFORE SENDING THE PRODUCT). Under the influence of these two Japanese spent their money on designing operating system that product with extremely small errors or mistakes.

Characteristics of TQM:

Adopting TQM as an method for conducting company business will have positive impact on key areas of corporate performance.

Important Features of TQM Are:

1. Customer satisfaction.
2. Leadership.
3. Integrated activities
4. Corporate culture - Improvement shown by employees
5. Stronger employee commitment
6. Totality
7. Documentation - Information regarding work assignment and responsibility
8. Improvements
9. Foundation

(Explain all the side headings)

Principles of TQM

1. Primary responsibility for product quality (Rest with top management).
2. Quality should be customer focused and evaluated using customer based standards (getting the feedback from customer's supervisor cant say product is good).
3. Production process and work methods must be designed consciously to achieve quality conformance.
4. Every employee is responsible for achieving good product quality.
5. Quality cannot be inspected into a product, so make it right the first time. " First impression , Best impression "
6. Quality must be monitored to identify problems quickly and correct quality problem immediately.
7. Organization must try for continuous improvement.
8. Companies must work with an extended TQM programmes to their suppliers to ensure quality inputs.

Benefits of Total Quality Management (TQM)

Advantages unique to TQM:

- It make the company leader not the follower.
- TQM creates goal direction connection between workers, customers and managers.
- Makes the company sensitive to consumer needs.
- Makes the company adopt more reality to change.

Benefits to consumer:

- Fewer problems with product.
- Better consumer care.
- Greater satisfaction.

Benefits for the company:

- Buy a product quality.
- Staff quality conscious.
- Productivity improvement.
- Reduce quality cost.

- Enhance the problem solving capacity.
- Increasing market.
- Increase competition and improve profit.
- Good public image provides goods and services of higher quality at low cost.
- Improvement in human relations.

Benefits to staff:

- Empowerment.
- Job interest and security.
- More training and skills.
- More reorganisation.

Causes of TQM failure

- Lack of commitment by top management
- Focus of specific technique rather than system
- According to process change for formula etc.
- Not obtain employee buying and participation
- Programme staff with training (no proper implementation)
- Expecting immediate result not a long term payoff
- Forcing organisation to adopt methods that are not productivity or compatible with production systems or personnel.

All the best for my students....

Wishes are not only to pass in exams but to succeed in life.

I believe my students in creating a better tomorrow.

-PJ