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C H A P T E R – II

INTRODUCTION TO THEORITICAL CONCEPTS

2.1 PRODUCTION MANAGEMENT :

Every industrial house has to perform two functions namely production and marketing of its product.

Production is nothing but sequence of operations that transform materials from a given to a desired form.

This transformation of materials may be by :

i) Disintegration.

ii) Integration.

iii) Service.

Philip Kotlar defines " Marketing is a anaslysis, organising, planning and controlling of the firms customer impinging resources, policies, activities with a view to satisfying the needs and wants of chosen customer groups at a profit."

In the present era of keen competition production needs some effective and scientific planning and regulation as it plays a very significant role in economic sense.

2.2 SCOPE OF PRODUCTION MANAGEMENT :

- Designing and packing of products;
- Production Administration–Production Engineering;

- Production planning and Production Control.
- Execution; and
- Dependent services and departments.

2.3 PRODUCTION PLANNING AND CONTROL :

Production area needs planning and control because in these days not a single production organisation is ideal or complete. There are some factors which are common to all production organisations namely men, machines, materials, money and ultimately management. All these factors should be utilised to the optimum extent in order to achieve the overall objective of the organisation, which is profit maximisation. The highest efficiency in production is obtained by manufacturing the required quantity of product, of the required quality, at the required time by the best and cheapest method. To attain this target, management employs production planning and control, the tool that co-ordinates all manufacturing activities.

2.4 SCOPE OF PRODUCTION PLANNING AND CONTROL:

Generally, speaking production planning and control is concerned with two important aspects of production viz.

A) Production Planning.

B) Production Control.

PRODUCTION PLANNING AND CONTROL

PRODUCTION PLANNING		PRODUCTION CONTROL	
1.	Sales Forecasting	1.	Routing
2.	Product Design and Development	2.	Scheduling
3.	Production Budget	3.	Despatching
4	Manufacturing Methods and Processes	4.	Follow-up
5.	Plant Layout		
6.	Organisation of Purchase		
7.	Organisation of Stores		
8.	Inventory Control.		
9	Internal Transport.		
10	Time and Motion Study.		

2.5 PRODUCTION PLANNING :

Production planning seeks to determine ahead as to what work shall be done, within what time it shall be done, where the work shall be done and devises the ways and means of doing it in the most efficient and cheapest method.

OBJECTS OF PRODUCTION PLANNING :

To plan systematically co-ordinated and related production activities within available resources of the enterprise to meet the demand of its product.

- To provide manufacturing requirements such as raw materials and their necessary constituents in right quality and quantity at the right time.
- To co-ordinate various departments of enterprise for maintaining proper balance of activities.
- To provide regular and steady flow of production activities.
- To equip management before hand for tackling any difficulty which may rise later on in achieving production target.
- To utilise production facilities to its maximum for minimizing operating costs and meeting delivery schedules.
- To ensure management for getting reasonable profit before hand.
- To promote further utilisation of plant.
- To assist workers engaged in production activities far doing right and greater earnings.
- To ensure in the light of production requirements, that certain specific job are created.

1. SALES FORECASTING :

Every business wants to know its future. But it cannot afford to indulge in mere guess work. For this reason, business leaders of the past have evolved certain systematic methods to know the future by scientific analysis based on facts and

possible consequences. This systematic method of probing the future is called forecasting.

OBJECTS OF SALES FORECASTING :

Following are the main objects of sales forecasting.

1. THE SHORT TERM OBJECTIVES :

- Formulation of suitable production policy.
- Regular supply of raw material.
- Best utilisation of machines.
- Determination of appropriate price policy.
- Regular availability of labour.
- Forecasting of short term financial requirement. .
- Seeting the sales target and establishing controls and incentives.

2. LONG TERM OBJECTIVES :

- Estimating cash inflows.
- Determining dividend policy.
- Planning of plant capacity.
- Man power planning.
- Planning of long term production.
- Forecasting or long run financial requirements.
- Budgetary control over expenditures.

METHODS OF SALES FORECASTING :

Out of the following various methods of sales forecasting a company can select any method to forecast their sales which is similar to their nature of company, nature of product, types of consumers, etc.

1. EXECUTIVE JUDGEMENT METHOD :

This is a process of combining and averaging or evaluating is some other way, the opinions are sought from the executives marketing, finance and other divisions of company and forecasts are made.

2. SALES FORCE COMPOSITE METHOD :

Under this method, views of the salesmen and sale executives are secured for the different market segments. There are many variations. The combined view of the sales force as to future sales expectations may be secured and careful scrutiny may be made at successive executive levels for the future sales estimates submitted by the individual salesmen.

3. THE USERS EXPECTATION METHOD :

Under this method of forecasting, actual users of the products are contacted and they are asked to submit the estimated

quantities of the product, they expect to purchase in a given future period. Total sales forecast of the product is the estimated by combining such responses.

4. EXPERTS OPINIONS :

Under this method the organisation collects opinions from the outsiders specialists in the field such as opinions given in the newspapers and journals, wholesalers and distributors, agencies or professional experts. By analysing there opinions and making deductions for the companies sales forecasts can be done.

5. MARKET TEST METHOD :

Under this method, seller sales the product in a part of the market for sometimes and makes the assessment of sales for the full market on the basis of results of test sales.

6. STATISTICAL AND QUANTITATIVE METHOD :

a) THE TREND METHOD :

Under this method, a trend of companies sales to other movements, is fixed with the help of historical data of different variable available. The statistical methods commonly used are trend and cycle projection and mathematical approaches including

moving average correlation analysis. The relationship is often expressed as a mathematical formula. With the help of formula trend is projected and the sales forecasts are made assuming that the same trend would continue in the future.

b) THE REGRESSION TECHNIQUE :

Here an attempt is made to estimate a statistical series of dependable variables through fitted relationship by using another variable called independent variable to which the first is related instead of using regularly spaced time intervals. Under this method, a curve is fitted with the help of correlationship between the dependent and independent variables. The methods used being either the least squares or the graphical correlation method. Sales forecast is made on the basis of economic indicators by using this technique.

2. PRODUCT DESIGN AND DEVELOPMENT :

A) PRODUCT DESIGN :

It is essential to design a product before starting its manufacture.

"Design is the conversion of knowledge and requirement into a form, convenient and suitable for use or manufacture."

The idea for new or improved products come from many sources such as :

- Customers suggestions and complaints,
- Research and Development Department.
- Other competative products in the markets.

Design Department modifies and extends the range of an original idea. This department consists of designers, engineers and draughtsmen.

Product design deals with. :

FORM DESIGN :

Form design takes care of products shape and appearance.

FUNCTIONAL DESIGN :

Functional design deals with its working.

REQUIREMENTS OF A GOOD PRODUCT DESIGN :

A) CUSTOMER SATISFACTION :

- The product should function correctly.
- It should have required standard of reliability.
- Product should be easy to operate.
- Product should have pleasant appearance.

- Product should be of reasonable price.

B) MAKING ADEQUATE PROFIT :

- It should be easy to manufacture the product within the available resources.
- A well designed product should be easy to pack and distribution.
- Good product design will call for minimum number of operations.
- The use of standard component parts wherever possible can lead to great saving.

B) PRODUCT DEVELOPMENT :

The continuous improvement of old products and development of old products is called as product development and has become essential in any modern organisation. If a company does not engage in product development, its product may become inferior to that of its competitiors, and it will lose its share of the market to them.

Product can be developed in one of the following way :

i) By Limitation

ii) By Adoptation

iii) By Invention.

PRINCIPLES OF PRODUCT DEVELOPMENT :

A) DIVERSIFICATION :

It involves the addition of lines of products, types and models. The diversification may be horizontal, by adding such new lines of products which are complementary and can be sold by the same sales organisation or produced by the same manufacturing equipment; Vertical, by adding such products which are vertically produced, such as materials and components and by-products, or may be lateral, by adding such lines which are entirely unrelated.

B) STANDARDIZATION :

Standardization is the process of setting standards. A standard is carefully established norm, measure, or specification, covering a method, material product, procedure or any other phase of business process. Standardization refers to the selection of certain quality, attributes, methods, processes or products or materials.

The range of standardization is very wide, but industrial standardization generally includes product standards, engineering design standards, raw material standards, process and equipment

standards, working condition standards and safety and administrative practice standards.

C) **SPECIALIZATION** :

Specialization means concentrating efforts on a particular field of action or towards a specific attempt. A worker is said to be specialized in a work when he acquires skill and proficiency in it by concentrating solely on it. Specialization can be applied to products, organisations, processes, regions, individuals, companies, machines, jobs, managements and so on.

D) SIMPLIFICATION :

Product simplification means elimination of extraneous of marginal lines, types and models of products. It is a practice of making something simpler, less complex or less difficult. Thus, product simplification includes elimination of superfluous varieties, sizes, types, packings, parts, processes and so on. Simplification is just the reverse of diversification of products. Simplification includes both simplification of products and simplified practices of manufacturing and marketing.

E) RENOVATION :

Here producer complitely change a nature and size of its old product and it shown in new manner.

3. PRODUCTION BUDGET :

A budget is an instrument of management used as an aid in the planning , programming and control of business activity.

A production budget may be prepared by production manager in consultation with his assistants after receiving the sales budget.

Production budget is the planning and controlling of the future production activities. This budget ensure the economical production and effective utilisation of manufacturing facilities. This budget deals with the cost relating to purchases of raw materials and stores, direct labour, machines and their depreciation, replacem ent and renewals etc.

Production budget is based upon :

1. Sales budget.
2. Factory capacity (Production and storage)
3. Budget stock requirements.
4. Economic lot size.
5. Availability of raw material and labour etc.

4. MANUFACTURING METHODS AND PROCESSES :

In economical terms production means creation of utility in a product. There are various methods of creation of utility

in a product. A production unit converts raw materials into finished product. There are various methods of conversion of raw materials into finished product, such as :

A) Continuous production.

i) Mass and Flow line production.

ii) Continuous And Process Production.

B) Intermittent Production.

i) Batch Production.

ii) Job Production.

5. PLANT LAYOUT :

After deciding an industrial location, an entrepreneur has also to decide regarding the important problem of plant layout, Efforts in selecting efficient machinery and constructing right type of building may be wasted without careful consideration of the problem of the actual layout of the plant.

National productivity council defines "Plant Layout is placing the right equipm ent coupled with the right method, in the right place, to permit the processing of a product unit in the most effective manner through the shortest possible distance and in the shortest time."

All facilities, like equipment, raw material, machinery, tools, fixture, finished goods, inprocess inventories, workers,

materials handing equipment etc. are given a proper place in the plant layout.

OBJECTIVES OF AN EFFICIENT PLANT LAYOUT :

- A good layout result in comforts, convenience, appearance, safety, efficiency and profits. A poor layout results in congestion waste, frustration and inefficiency.
- Economics in materials, work in progress and finished goods handling.
- Improvements in production processes and methods.
- Proper utilisation of area and floor space available.
- Minimizing of production delays.
- Better supervision and production control.
- Avoidance of bottlenecks.
- Avoidance of frequent and costly changes so that cost of production is not unduly increased.
- Ensuring safety for the workman so that chances of accidents are minimised.
- Provision of a layout that permits meeting of competitive costs.

TYPES OF PLANT LAYOUT :

There are four distinct types of layout that are to be found in different systems of production, they are :

1. Line or product layout.
2. Functional or process Layout.
3. Static Product Layout.
4. Mixed Layout.

6. ORGANISATION OF PURCHASE :

The efficiency of any industrial organisation is contingent upon making the materials, supplies and equipment available in the proper quantity, of the proper quality, at the proper place and time and of the proper price. Failure on any of these points adds to cost and decrease in margin of profit.

Alford and Beatty defines, " Purchasing is the procuring of materials, supplies, machines, tools and services required for the equipm ent, maintainance and operation of a manufacturing plan."

Dr. Walters defines scientific purchasing is the "Procurement by purchase of the proper materials, machinery, equipm ent and supplies or stores used in the manufacture of product, adopted to marketing in the proper quality and quality, at the proper time and at the lowest price consistent with the quality desired."

OBJECTIVE OF PURCHASING :

The major objectives of scientific purchasing may be summarised as under. :

- To procure required quantity and quality of materials at the right price.
- Maintaining continuity of supply to ensure production schedule at a minimum of investment.
- Avoidance of duplication waste and obsolescence of materials and equipments.
- To improve, quality and distribution of product by means of selection of adequate materials.
- Creating goodwill and enhancing reputation of the company through dealings with the suppliers.
- To maintain companies competitive position.
- Co-ordination and maintainance of internal relationships.

PRINCIPLES OF SCIENTIFIC PURCHASING :

There are six R'S of wise or scientific purchasing.

- Right Quality.
- Right Quantity
- Right time of Delivery.
- Right Price.
- Right Source of Supply
- Right Place of Delivery.

PURCHASING PROCEDURE :

The main steps in the purchasing procedure may be listed as below. :

- Recognition of the need.
- Scrutiny of requirements.
- Selecting of possible sources of supply.
- Determination of Price and availability.
- Placing the order.
- Follow-up and expediting of the order.
- Checking invoices.
- Processing discrepancies and rejections.
- Closing compeleted order.
- Maintainance of records and files.

METHODS OF PURCHASING :

1. PURCHASING BY REQUIREMENTS :

Under this system purchases of goods are made only when required. This system is used for goods which are not regularly purchased. These are the goods used so frequently that they are not to be kept in stock.

2. PURCHASING FOR A SPECIFIED FUTURE PERIOD :

This method is used to purchase goods which are used regularly but relatively in small quantities and on which price variations are not very great.

3. MARKET PURCHASING :

Purchases made to take advantage of price fluctuations is known as market purchasing. In this method the reasonable requirements based on production planning are calculated. Market trends are analysed and then purchasing is done.

4. CONTRACT PURCHASING :

Spriegel defines contract purchasing as " The purchasing under contract, usually formal of needed materials, the delivery of which is frequently spread over a period of time." This method is particularly useful in case of raw material prices of which fluctuate much.

5. SPECULATIVE PURCHASING :

Under this method, purchases are made in excess of needs at the time when market is low with the hope of selling the excess quantity of purchased items at future data at a profit.

6. SCHEDULED PURCHASING :

Under this method the purchases are scheduled and made to co-ordinate with the present and future requirements of production Vendors are given approximate estimates of purchase requirements over a period of time ahead.

PURCHASING FORMS :

The forms introduced for various purchasing activities should have the qualities of facilitating the recording of necessary data, leaving good impression, easily understandable by the users, minimizing the possibility of errors, describing all necessary informations and affecting economy. The various forms used are :

- Purchase Requisition.
- Request for Quotation.
- Purchase Order.
- Follow-up form.
- Receiving Form.
- Rejection Form.

7. ORGANISATION OF STORE :

Materials and supplies constitute the most important assets in the majority of business enterprises. The success of business besides other factors, depends to a large extent on the efficient storage and material control.

Alford and Beatty defines " Storekeeping is that aspect of material control which is concerned with the physical storage of goods."

Storekeeping is a service function which deals with physical storage of goods under the custodians of a person termed as storekeeper or store controller. Unworked or raw materials are usually known as the stores, and the place where these are kept is known as the Store Room.

OBJECTIVES OF STOREKEEPING :

In brief, storekeeping has to a ccomplish the following objectives.

- Economical and efficient receiving, handling and issuing of stores goods.
- Use of storage space and labour effectively.
- Protection of goods stores against fire loss, labour theft and obsolescence.
- Facilitating inventory taking.
- Minimising inventory investment.
- Facilitating ordering of required materials.
- Maintaining supply of required materials regularly at all times.

LOCATION OF STORES :

Location of the stores should be carefully decided and planned so as to ensure maximum efficiency. Stores location

depends upon the nature and value of the items to be stored and the frequency with which the items are received and issued. All departments should have easy access to the stores. There are two kinds of organisation of storekeeping.

i) CENTRALISED STORES SYSTEM :

In this system the main store located centrally fulfills the needs for each and every department.

ii) DECENTRALISED STORES SYSTEM :

In this system, each section of the industry has separate store attached with it.

LAYOUT OF STORES :

A good stores layout practice is one which usually brings, the point of origin, store rooms and point of use in adjacent and proper sequence for best flow of materials.

OBJECTIVES OF LAYOUT OF STORES :

i) To achieve minimum wastage of space.

ii) To achieve maximum ease of operating

STORE RECORDS :

Two records are usually kept of materials and other goods received, issued or transferred namely Bin Cards and in the store ledger.

1. BIN CARDS :

In a store room, materials and other items are kept in appropriate bins, drawers. For each kind of material, a separate record is kept on a Bin Card which shows details of quantities of each type of material received, issued and on hand each day. Bin Card is attached to each bin or shelf.

2. STORE LEDGER :

Store ledger is identical with bin card except that money values are shown. The ledger is usually of the loose-leaf or card type, each account representing an item of material in store. The store ledger accounts may be maintained by a separate material accounting department or in small concerns by the store keeper himself.

MATERIAL REQUISITION SLIP :

A requision is a written authority for the store to issue materials to any person or section of the organisation entitled to draw materials from the stores. The requisition should have columns for class and code numbers, description quantity required , quality issued, date of issue, requisition number, signature of the issuing store keeping, signature of the receiver of materials.

VALUATION OF MATERIALS ISSUED FROM STORES :

Following are some methods of valuation of materials issued from stores.

1. FIST IN FIRST OUT METHOD :

In this system goods received are entered in the stores records at actual cost plus other charges such as freight, taxes, insurance etc. The material first received are issued first, Materials from second lot are issued only when first lot is exhausted. The price are charged at the cost at which that lot was purchased.

2. LAST IN FIRST OUT METHOD :

In this method the material of the lot of a particular item is first issued and hence the price of material issued is charged at the rate of material received in the last lot (The newest lot price). If the last lot exhausted then the price of the remaining last lot is considered.

3. MARKET PRICE METHOD :

This method charges current market price for the materials irrespective of the purchased price.

4. AVERAGE PRICE METHOD :

In this method average cost of material is charged for the product. Following are the ways of determining the average price.

i) SIMPLE AVERAGE METHOD :

It means the average cost of material in hand on the date of issue of stores. Each time, when the material is issued, average cost is calculated. Therefore, the new calculations are necessary after every entry to obtain the mean price.

ii) MONTH END AVERAGE METHOD :

In this method average cost of each type of material is calculated at the end of each month and is charged for all the issues during the following months.

8. INVENTORY CONTROL :

Every business organisation however big or small has to maintain some inventory. Inventories cost money, not only in acquiring them but also in holding them. A significant portion of the capital is invested in inventories. So that every organisation has requires careful planning, formulation of policies and procedures appropriate to maintain the stocks at some desired level.

"Inventory includes each and every goods which store in store department" e.g. production inventories, MRO inventories, work in progress inventories, finished goods inventories.

"The technique of maintaining the size of the inventory at some desired level keeping in view the best economic interests of a organisation is known as inventory control.

METHODS OF INVENTORY CONTROL :

1. SCIENTIFIC SYSTEM OF INVENTORY CONTROL :

In scientific system of inventory control, the following levels and quantities are fixed for each class of item.

1. THE MINIMUM LEVEL :

The minimum level is that level below which supplies should never drop. The exact quantity which this minimum represents is determined by the rate at which an item is used, its importance in the process, the normal procurement, whether substitutes are available and similar factors. Idally, a new shipment should arrive just as the stock reaches the minimum.

2. THE RE-ORDER POINT :

The Re-order point is the quantity level of which a replenishment order should be issued to ensure that fresh supplies will arrive in sufficient time to keep the item from running out of stock.

3. THE ECONOMIC ORDER QUANTITY :

The economic order quantity is that the amount of material which will be requisitioned each time available balances drop to the order point. Economic order quantity is determined by

considering such things as vendor's quantity discount, rate of use, price, transportation, handling and storage costs and the danger of deterioration and obsolescence.

4. THE MAXIMUM LEVEL :

This term is applied to designate the upper limit of the inventory and represents the largest quantity which in the interest of economy should gene rally be kept in stores.

5. DANGER LEVEL :

The difference between zero and the established minimum quantity is called as Danger level. When stock reaches to this level issues are completely stopped.

2. INVENTORY CONTROL BY ABC ANALYSIS :

ABC analysis helps segregating the items from one another and tells how much valued the item is and controlling it to what extent is in the interest of the organisation.

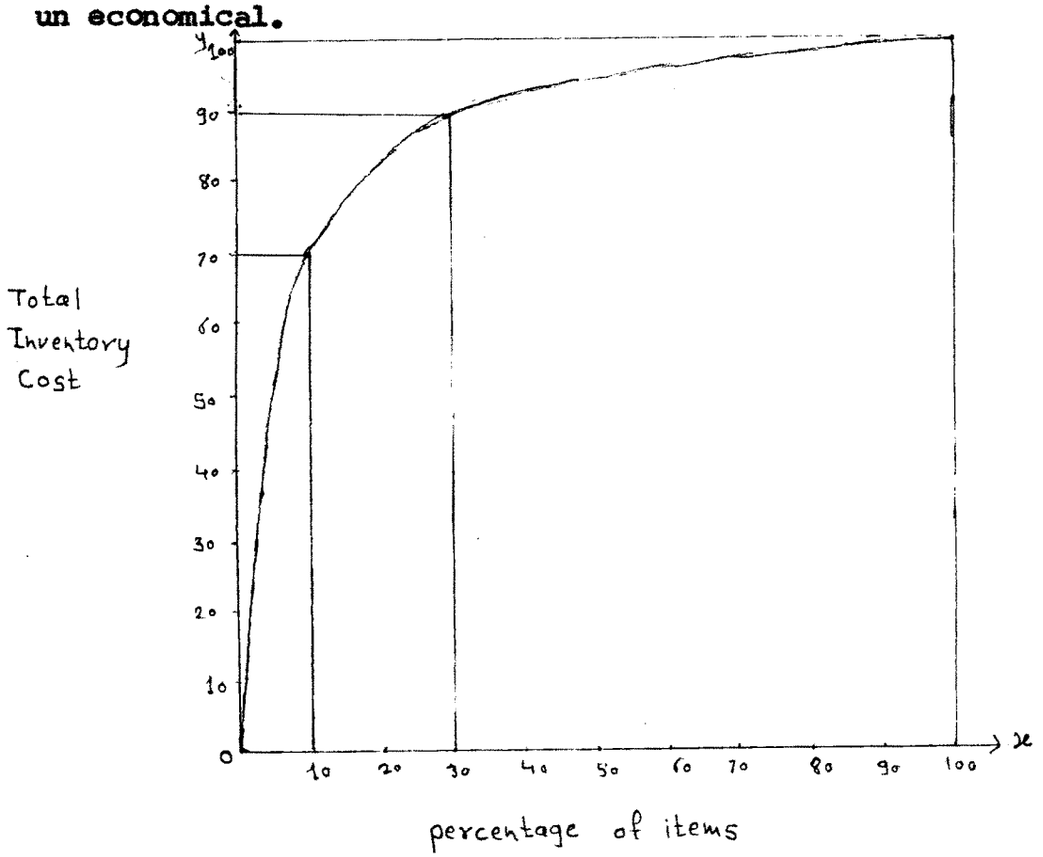
PROCEDURAL STEPS :

- Identify all the items used in an industry.
- List all the items as per their value.
- Count the number of high values, medium valued and low valued items.

- Find the percentage of high, medium and low valued items,
- A graph can be plotted between percentage of items(on x axis) and percentrage of total inventory cost (on y axis)

ABC analysis furnishes following information. :

1. A- Items are high valued but are limited. They need careful and close inventory control.
2. B-Items are medium valued and their number laid in between A and C items. Such items need moderate control.
3. C-items are low valued, but maximum numbered itmes. These items do not need any control, rather controlling them is un economical.



3. STOCK TAKING OR PHYSICAL VERIFICATION :

Following are the three methods of physical verification.

1. ANNUAL STOCK VERIFICATION :

In this method verifying officer, checks the stock lying in stores once in a year, so as to see that the quantities as shown in store ledger, bin cards and actually available in bins tally each other. The advantage of this method is that a thorough check of all the work is performed at a time and all the discrepancies are known collectively.

2. PERPETUAL INVENTORY CONTROL :

In this method, periodically, the balance of amount as shown on the bin card is compared with the physical quantity in the container. As this process is carried on through out the year. The advantage of this method is that the production need not to be shut down for some time.

3. PERIODIC PHYSICAL INVENTORY :

Periodic physical inventories at all times during the course of the year. So that each time is inventoried at least once during the year. This method does not disrupt operations in the plant and places a steady load on the personnel taking the

inventory.

9. INTERNAL TRANSPORT AND MATERIAL HANDLING :

Materials handling as a specialised activity for modern manufacturing concern. It has been estimated that about 20–25 per cent of the cost of production is spent in materials handling activities, as majority of production time is consumed in handling materials. This cost can be reduced by proper selection, operation and maintainance and also layout of materials handling devices.

"Materials handling" refers to the moving of materials from the store room to the machine and from one machine to the next during the process of manufacture."

Here raw materials, tools, equipments are transported from godown to production station and also produced goods are transported from production station to godown.

Efficient materials handling reduces internal transport cost, prevents pilferage, damage and wastage of materials in transit, minimizes accidents and fatigue of working people, shortens processing times and prevents delays in production permits effective use of space and helps in maintaining better plant climate and cleanliness.

MATERIAL HANDLING DEVICES SELECTIONS :

The usual manufacturing cycle consists more in moving than making the things. Hence, full attention must be paid in fitting the internal transport system in the manufacturing plants so that they constitute a single unit. The selection of materials handling devices depend upon the following factors.

- Type size, shape of product.
- Volume of production.
- Methods of Manufacture and sequence of processes.
- Space available.
- Possibility of future expansion.
- Cost of installation, operation and maintainance.
- Plant building, layout and conditions.

MATERIALS HANDLING DEVICES :

A) LIFTING AND LOWERING DEVICES :

i) A block and tackle

ii) Hoists

iii) Winches

iv) Elevators

B) TRANSPORTING DEVICES :

I) Hand trucks

ii) Industrial railway

iii) Tracters and Trailers.

iv) Aerial tramways

v) Skids

vi) Pipelines.

C) COMBINATION DEVICES :

i) Chutes

ii) Trolly hoists

iii) Lowerrators

iv) Power lift trucks

v) Portable elevators

10 TIME STUDY AND MOTION STUDY :

A) TIME STUDY :

To give competitive quotations, estimation of accurate labour cost is very essential as it has got large effect on the price. If the prices are higher it affects the sale and if the prices are lower then losses may occure. Thus, exact estimation of time is very essential for correctly pricing. As labour cost depends upon time estimation, there fore, time must be estimated as correct as possible.

F.W. Taylor defines " Mere statistics as to time which a man takes to do a given piece of work do not constitute a time

study. Time study involves careful study of the time in which work ought to be done."

Time study includes a detailed analysis of both 'machine time', or time taken by the machine in doing its share of the work and 'manual time' or the time taken by workmen.

USES OF TIME STUDY :

- Provides a sound basis for incentive schemes.
- Show up ineffective time.
- Basis for planning and scheduling of produ-ction
- Estimates for Tenders, selling prices etc.
- Fixing the standard labour costs.
- Standards of machine utilisation and labour performance.

THE STUDY EQUIPMENT :

Time study is a 'Stop Watch Time Study' as observation are taken by a watch which has markings of one hundredth of a minute.

THE METHODS OF TIMING :

1) CONTINUOUS TIMING :

In this method, the large hand runs, continuously and the recording is done by lifting the reading of the watch at the end

of each operation element.

ii) SNAP BACK TIMINGS :

In this method, the watch is started at the bigining and stopped at the end of the operation element. The watch is then read, the time recorded and the hand of the watch shapped back to zero. This process is reported workers oppose this.

iii) ACCUMULATIVE METHOD :

This method allows direct reading of the time for each operation element by the use of two watches connected by a lever machanism so that, when one watch starts, the other stops, automatically.

TECHNIQUES OF TIME STUDY :

1. TIME STUDY WITH A STOP WATCH :

Time study with a plain decimal stop-watch is a very popular techniques for determining, as accurately as possible, from a limited number of observation, the time necessary to carry out a given activity at a defined standard of performance.

2. PREDETERMINED STANDARD TIMES OR SYNTHETIC TIME STUDY :

According to this technique, time standards are build up or synthesised from element times previously obtained from direct time studies. They are, in a way, a substitute for individual

time studies.

B) MOTION STUDY :

Frank Gilberth defines, " Motion study is the science of eliminating wastefulness resulting from unnecessary, all directed and inefficient motions. The aim of motion study is to find perpetuate the schemes of least waste methods of labours."

TOOLS OF MOTION STUDY :

1. PROCESS CHARTS :

A process chart is a graphic representation of the sequence of events or steps that occure in the work method of procedure, classifying them by symbols according to the nature of the event.

The two principal activities in a process are operation and inspection. These are represented by the following symbols.

O - Operation = - Inspection.

If operations occures frequently following symbols were used.

TRANSPORT :

D Delays or Temporaty storage.

Δ Storage.

A process chart using these symbols gives a complete picture of a process and there by helps to improve it.

2. PRINCIPLES OF MOTION STUDY :

This the technique for improving jobs. The following principles should be kept in mind.

a. Rules of intelligent laziness.

b. Rules for keeping busy.

c. Rules for reduction.

d. Rules for placing man.

3. MOTION STUDY QUESTION :

Suggestive questions are among the important tools of motion study.

4. MICROMOTION STUDY :

Some motions requires very small time and it is difficult to measure time for these motions accurately. Therefore, the motion are taken on picture films with the help of picture camera. When picture camera is used, the procedure is known as "Micromotion study."

5. THERBLIGS ANALYSIS :

Frank Gilbreth developed a set of 17 elementary motions commonly found is manual operations and called the "Therbligs." For the purpose of recording the motions, he split up different

motion of a process into 17 fundamental mental events made by various members by human body and each event was alloted a symbol and letter abbreviation. These symbols abbreviations are used for preparing motion study charts.

THE METHODS OF MOTION ANALYSIS :

1. QUANTITATIVE ANALYSIS RELATIVE TO TIME :

In this method, motion studies are made of two or more workers on the same operation, time studies are then made of the two time studies and operation elements. A comparision of the two time studies will show the elements on which each workman appears to have an advantage, and a comparision of the corresponding motion studies will usually show why the combining the best elements of these workmen, a new method can be developed which would be superior to the method used by any of these workers.

2. QUALITATIVE ANALYSIS :

When only one person does an operation, it is necessary to rely entirely on a qualitative analysis of motions on the basis of the established laws of motion economy. Those were first stated in the form of 17 laws by Gilbreths who pioneered the motion study. They have been now rearranged into five laws and eight corollaries.

2.6 PRODUCTION CONTROL :

Production control is a fundamental manufacturing managerial function that usually follows other functions. Production plans are not capable of self, actuating and do not lead to automatic accomplishm ent. To achieve organisational objectives and completing production plans, production managers have to regulate work assignment, to review the work progress and check operations falling with their jurisdication.

British Standards Institute defines, " Production control is the mixture of the principles of factors namely planning, scheduling, despatching, stock control, routing and progress."

TECHNIQUES OF PRODUCTION CONTROL :

Various manufacturing concern adopting following techniques of production control for controlling their production function.

1. THE GANTT CHARTS :

It is frequently used to keep track of multiple machine schedules, Gantt Chart is actually a modified Bar Chart, where in load is marked against a time scale with one horizontal bar or line allocated to each machine.

A Gantt Chart displays the following :

- Plans for Future.
- Progress on present operations.
- Past achievements till date.
- Relationship among several variables.

- It focuses attention on situations threatening delays.
- It tells whether a plan has fallen short and if the delivery dates can be met.
- A curve attached to the Gantt Chart can be moved across the chart to know the work progress till any particular day. Following is the two basic type of Gantt Chart. :

i) ORDER CONTROL CHART :

Time (in weeks/ days) is marked along the horizontal axis, and orders in hand are listed along the vertical axis. The amount of work planned or scheduled is shown by the firm line and the machine on which the order will be processed is marked on the line. The actual progress of various orders is shown dotted.

ii) MACHINE LOAD CHART :

Time is marked along the horizontal axis and various machines are listed along the vertical axis. The amount of work planned and the actual progress made have been shown by firm and dotted lines respectively. Orders by their numbers have been marked on the horizontal firm lines.

2. PRODUCTION CONTROL BOARDS :

Production control boards are more used then the Gantt Charts, both in individual production department of a factory as well

as in the central production control office, These boards have two rows of small holes across the board for each line along the left. The use of machine can be shown by placing pegs with strings attached, in holes for the time that the jobs will start and stop. One row of holes shows the plan for the machine use. Production day by day, can be shown by inserting other pegs in the second row of holes for each machine. Coloured and numbered pegs permit the board to give a great deal of information. A string placed vertically and moved daily issued to show the present position and allows easy spotting of all instances where production is logging.

3. CRITICAL PATH METHOD (CPM) :

The use of this technique of modern network system has become very essential. This was developed in 1957 and is suitable for the construction of Civil and Mechanical Projects and for scheduling plant maintainance etc. C.P.M. technique is useful to determine how best to reduce the time required to perform routine production, maintainance and construction and to minimise the direct and indirect expenses.

With the help of C.P.M. a manager can know that which operation should be started after completing a particular

operation and what is the progress of the work is related to the scheduled timings ? It also tells that at what moment and in what operations time schedules are adhered strictly so that future programme is not affected and where it may be delayed and in what extent without affecting the last date of completion of project.

TOOLS OF PRODUCTION CONTROL :

In order to ensure that the right product is produced in the right quantity, of the right quality, at the right time and by the best and least costly methods, the production control department has the following four tools at its command.

1. Routing.
2. Scheduling.
3. Despatching.
4. Follow-up.

1. ROUTING :

Routing lays down the flow of work in the plant. It determines what work is to be done and where and how it will be done. Taking from raw material to the finished product, routing decides the path and sequence of operations to be performed on the job from one machine to another.

Spriegel and Lansburgh defines " Routing includes the planning of where and by whom work shall be done, the determination of path that work will follow and the necessary sequence of operations."

2. SCHEDULING :

Once the Planning(Work) to meet sales is complete and set of decisions have been formulated using graphical or linear programming methods the next step is the implementation of the decisions through detailed plans and schedules.

Spriegel and Lansburg defines " Scheduling involves establishing the amount of work to be done and the time, each element of the work will start and the order of work."

KINDS OF SCHEDULING :

The following are the kinds of scheduling :

1. MASTER SCHEDULING :

Assigning of the dates which important features of production are to be completed.

2. OPERATION SCHEDULING :

The assigning of the time required to do a given piece of work with a given machine or process.

3. DETAIL OPERATION SCHEDULING :

The assigning of the time required to do each detail operation of a given job with a given machine of process.

CONTROL CHARTS IN SCHEDULING :

1. MACHINE LOAD CHARTS :

It shows the load on each machine and informs when a machine is over loaded or underloaded for a certain period, say a week.

2. PROJECT LAYOUT CHART :

Project chart schedules in advance the work ahead of either men or equipment, or both and determines the relative importance of the work and hense the sequence in which it should be performed.

3. PROGRESS CHART :

The progress chart compares the progress or accomplishment made against a prescribed plan. It direct attention to failure, thus making possible appropriate investigation and action.

3. DESPATCHING :

Despatching is another important technique of production control. It is a doing function of production management and initiates actual manufacturing in accordance with the work of routing and scheduling.

Spriegel Lansburgh defines " Despatching involves the meeting of schedules by proper utilisation of machines, work

places, materials, and workers as designated by the routing."

According to the above definations orders were issued to following departments.

1. Store Departments.
2. Tools Departments.
3. Work Shops.

FORMS USED IN DESPATCHING

1. WORK ORDERS :

While starting the production, work orders are issued to departments to commence the desired lot of products.

2. TIME CARDS :

Each operator is supplied with this card in which he mentions the time taken by each operation and other necessary information,. These are helpful for the wage payments.

3. INSPECTION TICKET :

Inspection ticket is employed to report the quality of work passed and the quantity rejected at each inspection operation.

4. MOVE TICKETS :

These tickets are used for authorising over the movement of the material from store to shops and from operation to operation.

5. TOOL AND EQUIPMENT TICKET :

It authorises the tool department that new tools, gauges, jigs, fixtures and other required equipments may be issued to shops.

4. FOLLOW- UP :

After despatching production orders to various shops, it is necessary to regulate the progress of job through various processes. For this purpose, a follow up section is formed.

Bethel and Others defines " Follow up or expending is that branch of production control procedure which regulates the progress of materials and parts through the production process."