

CHAPTER III

3.1 INTRODUCTION TO SCIENTIFIC INVENTORY CONTROL MANAGEMENT SYSTEM

Inventory is stock of goods (or materials) required by an organisation for its successful operation. Inventory control refers to the process whereby the investment in materials and parts carried in stock is regulated within predetermined limits set in accordance with inventory policy established by Management. To a materials controller inventory refers to the materials he is asked to purchase and keep safe in the store house, so that they may remain serviceable till their use. But to a finance controller inventory can notes the value of material carried in the storehouse in which the funds of the organisation stand invested, in the finance controller view inventory means an idle capital. On the other hand the production controller reacts happily when there is sufficient stock of material in storehouse and he reacts violently when he feels that there is lack of inventory, in such cases the production controller blames the materials controller for his idle pipeline. The Marketing Manager is happy when there is regular flow of finished goods to the market but when it drives up he puts the blame with

justification on the dried-up pipeline, which is nothing but the shortage and inventory of finished goods. From the above situation it is clear that every one in the organisation is concentrated with his own operation and when a situation arises he never fails to put blame on others who are directly responsible for such an adverse situation.

Materials Controller is the person in the organisation who walks on a tight rope and who has to burn his fingers all the time even without murmuring. He has to stock all types of materials ranging from raw materials to finished goods and other item so that the production and marketing operations must run regularly smooth by keeping the finance controller's idle capital at its minimum. The Materials Manager's position in an organisation certainly is that of a pivot (the central point) but surely not an enviable one.

3.1.1 WHAT IS INVENTORIES ?

In Broad Sense, inventory may be defined as the stock of goods, commodities or other economic resources that are stored or reserved in order to ensure smooth and efficient running of business affairs.

The inventory of goods may be kept in any of the following forms.

I. RAW MATERIAL :

Raw materials which are kept in stock for using in the production of goods.

II. WORK IN PROCESS :

Semi finished goods in process which are stored during the production process.

III. FINISHED GOODS :

Finished goods awaiting shipment from the factory.

IV. SPARES :

Spares are important inventories and they are class in themselves. The consumption pattern different from other types of inventories. Spares are governed by special policies and their problems are of special nature and hence are solved differently. On the basis of the use and nature spares are classified into various classes i.e. (i) Maintenance Spares (ii) Overhauling Spares (iii) Rotable Spares etc.

V. CONSUMABLES :

Those materials used in the manufacturing process which can not be used for the second time for the same purpose i.e. Coal, Coke, Lubricants, Varnishes Stationery etc.

VI. MACHINERY AND EQUIPMENTS :

All the machinery both power and hand driven such as presses, typewriters, electric meters and other machines used in the production is classified as such Tools also come under this category.

VII. INFLAMMABLES :

Items highly susceptible to fire such as diesel, petrol, paints etc. fall under this category. Due to their hazardous nature they are generally stored as far away from the main building with complete fire fighting arrangements.

VIII. FURNITURE :

Movable contents of an organisation such as Tables, Chairs etc. are furniture item.

IX. GENERAL STORES :

This category includes all those items which do not fall under any of the above categories of stores. In a large undertaking general stores section is separated from other stores.

X. SCRAP MATERIAL :

On the expiry of life of a particular item the residue is called as scrap. The scrap is sold out in the market so as to fetch some value out of it.

XI. PACKAGING MATERIAL :

These include all kinds of wrapping materials such as paper, wood carvings, gunny bags etc.

XII. FUEL STOCK :

These are also consumable stores but there is slight difference between the two in respect of their use when an item is directly used for production and is a fuel for furnace, oven etc. it is classified as fuel stock.

3.1.2 CLASSIFICATION ACCORDING TO CONDITION OF MATERIAL

The materialised can be classified according to their condition or usability as under.

I. SERVICEABLE, UNSERVICEABLE AND OBSOLETE STORES

Serviceable stores are those stores which go temporarily out of order. After repairing and replacement they may become serviceable again and their usable life may thus be extended for some more time.

Unserviceable stores are those items which have out lived their life. No amount of repairs, renewals or replacements can bring them back to their usable life. They are fit for disposal as scrap.

Obsolute stores are those items which have gone out of date because of new inventions in design, use etc. and which cannot be used again.

II. FINISHED AND SEMI-FINISHED STORES :

The goods which is ready for sale in market is stored in finished stores where as the goods which require some other processing for sale in market is stored in semi-finished stores.

III. DEAD-STOCK :

Furniture, requirements, machinery and other items which have some definite life and which cannot be written off before the expiry date of their life are classed as dead-stock items.

3.1.3 FUNCTIONS OF INVENTORY

Inventories are essential for keeping the production wheels moving. Inventories serves as lubrication and spring for production, distribution system. Following are the important functions of inventories.

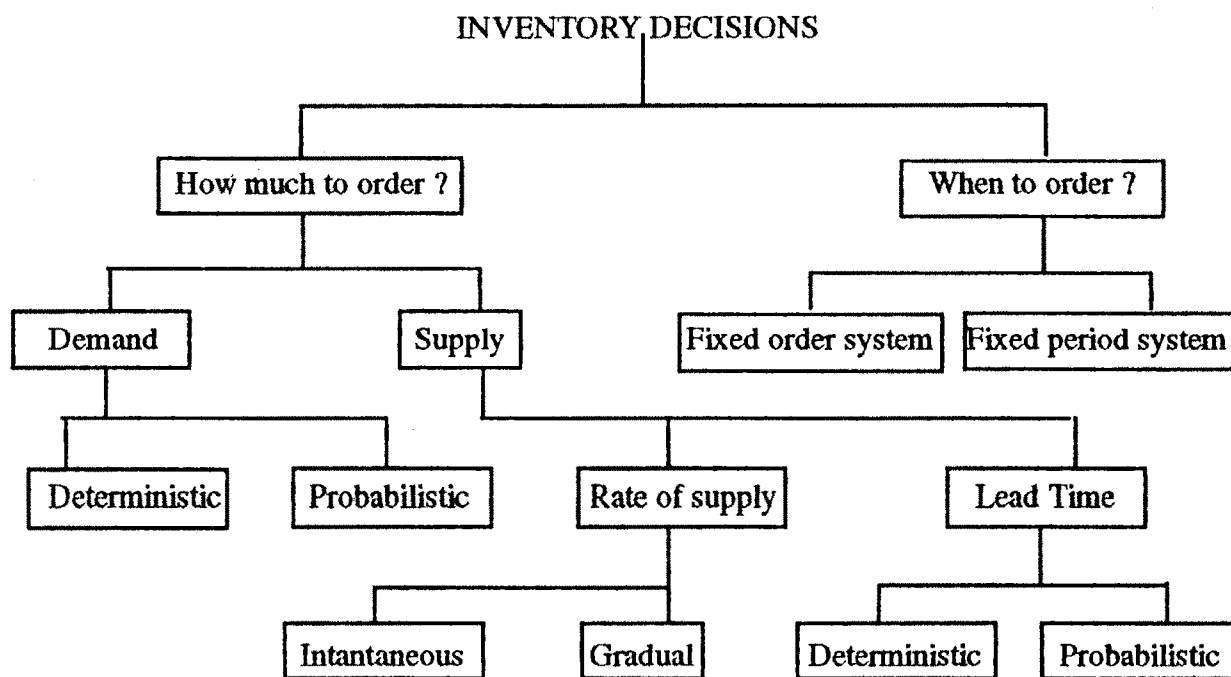
- i) Inventories gear up production.
- ii) Inventories force consumption to adopt itself to the necessities of production.
- iii) Inventories advise the market.
- iv) Inventories provide a cushion to prevent stock outs.
- v) Inventories help in stabilizing employment in an organisation.
- vi) Inventories help in utilisation plan for future.
- vii) Inventories strike a balance between the objectives of the stores department and those of an organisation as a whole.
- viii) Inventories avoids unnecessary wastages and blocking up of valuable working capital.
- ix) Inventories acts as an insurance against errors in demand forecasts.
- x) A well planned inventory scheme helps in efficient, smooth and effective service to customer at a lowest cost with lower investment through planned but reduced inventories.

3.1.4 SIGNIFICANCE OF INVENTORY CONTROL

Inventory control signifies a planned approach of ascertaining when to indent, what to indent, how to indent and how much to stock so that costs involving buying and storing are optimally minimum without interrupting production or affecting sales. Inventory control basically deals with ;

- i) When should an order be placed (order level)
- ii) How much should be ordered (order quantity)

These questions are answered through the use of inventory cost models. The control of inventories can be strengthened through the use of appropriate models. These models are developed through using a process which systematically considers all of the characteristics of the inventories being controlled.



3.1.5 TECHNIQUES OF INVENTORY CONTROL :

The following are the different tools and techniques of inventory control.

- i) Analytical method of control based on ABC analysis (Selective Control).
- ii) Application of Economic Order Quantity (or how much to order).
- iii) Determination of Re-order point (or when to buy).
- iv) Selection of replenishment system (Re-ordering System).
- v) Codification.
- vi) Standardisation.
- vii) Simplification (or variety reduction).
- viii) Computerisation.
- ix) Application of probability & demand forecasting quantitative techniques = Operation Research.
- x) Review of surplus and non-moving inventories.
- xi) Use of Control Ratios.
- xii) Reporting.

3.1.6 OBJECTIVES OF INVENTORY CONTROL

Inventory control is a highly significant function not only because inventories constitute substantial portion of total current assets of a firm but also it has to satisfy the following objectives.

- i) To minimise the financial investment in inventories.
- ii) To ensure that the value of materials consumed is minimum.
- iii) To maintain timely records of inventories of all times and to maintain the stock within the desired limits.
- iv) To provide scientific base for short term and long term planning of inventory requirements.
- v) To ensure timely action for replenishment.
- vi) To protect the bank of inventories from pilferage, theft, waste, loss, damage and unauthorised use.
- vii) To standardise and centralise information on stock levels and progress of stock issues.
- viii) To meet demand fluctuations.
- ix) To provide a safeguard for variations in raw material delivery time or lead-time.
- x) To allow flexibility in production scheduling.
- xi) To reduce surplus stock.

3.1.7 CONCEPTS OF INVENTORY CONTROL

I) INVENTORY CARRYING COST

Inventory carrying cost refers to the holding store. Inventory is money but is not at all like money in a bank it is money on which you pay interest instead on earning interest. After year Rs. 100 in a bank becomes Rs. 110 but after a year on the self Rs. 100 of inventory will naturally will be worth less than Rs. 100 and it will also cost Rs. 10 more as inventory carrying cost.

The Inventory Carrying Cost is also called as hidden cost because there is no specific account for it. Nevertheless the cost is considerable and has to be accounted for. The inventory carrying cost can be divided in to three main components

i) CAPITAL COST

Generally capital cost represents interest charges if borrowed but there are certain firms who do not borrow money, hence the are not required to pay interest but even if they are not to pay interest it cannot be denied the capital cost is associated with stock lying in store. The capital cost may be called as opportunity cost of capital which is incurred in withdrawing

funds from productive activities for the purpose of investing them in inventories.

It is calculated on the basis of the return on capital e.g. if 20 % is the return on the capital the "opportunity cost" of the capital will be taken as 20 % , this cost is considered while computing inventory carrying cost. The storage & preservation cost of inventory are also be included in inventory carrying cost.

ii) STORAGE AND HANDLING COST

This is an operational cost which is most obvious inventory carrying cost it includes the whole expenditure related with store keeping functions. The storage cost varies with the type of material stored etc. Usually the range of this cost is between 5 % to 10 % of the value of material stored per year.

iii) COST OF DETERIORATION, OBSOLESCENCE AND OTHER KINDS OF LOSSES

This cost sometimes forms the major part of inventory carrying cost. It can neither avoided or overlooked. Due to these type of cost an estimate may even go wrong and hence effects on forecasts. Therefore overstocking is to the greatest ill of the store department.

Obsolescence is one of the price that must be paid for industrial and technical progress. The total cost on account of deterioration and obsolescence etc. is ranging from 10 % to 20 %.

II) PROCUREMENT COST

Procurement cost also called as ordering cost, replenishment cost or procurement cost, is the cost incurred to replenish the stock of an item. The cost includes requisitioning, ordering, follow up, receiving, inspection, record keeping and bill payment per period by the number of orders processed during that period.

Basic elements of procurement cost are as under-

- i) Paper work cost
- ii) Postage cost
- iii) Follow up cost
- iv) Cost of visits to the vendors plants
- v) Expending cost (Alternate arrangement cost)
- vi) Operating cost
- vii) Inspection and testing cost
- viii) Administrative cost

III) SET UP COST

It is also called as preparatory cost, is the cost that is incurred to replenish the stock of an item manufactured at the home plant. The major elements of these cost are as under.

i) IDLE TIME COST

Is the loss due to inability of the company to produce during the period when the machine is under setup. (Set up time is the total time necessary to prepare a machine for the production of good pieces)

ii) COST OF IDLE WAGES

Is the cost required to pay to workers during set up time.

iii) WORK ORDER COST

Is the cost raising a work order and other auxiliary orders i.e. issue order, move orders, inspection orders etc.

IV) STOCK OUT COST

Is the cost of loss during nonavailability of the item when it is required. The major elements of the stock out cost are as under -

- i) Machine and manpower cost when idle.
- ii) Cost due to loss of profit
- iii) Cost due to excess price (premium) paid.
- iv) Cost due to penalty paid
- v) Cost due to overtime paid
- vi) Cost due to customers dissatisfaction
- vii) Cost due to loss of business

The effect of stock out cost is multisided. It is not possible to estimate the range of cost, but it is important to take inventory decisions.

3.1.8 VARIOUS CONTROL LEVELS

For acting judiciously, systematically and scientifically it is necessary to fix the following different levels (points).

I) MAXIMUM LEVEL

Maximum level represents the level beyond which the stock in hand is not allowed to excess , because

a) If stock exceeds this level it will involve more investment, require more space, more wastage due to more handling , more damages & involve more carrying cost.

b) Excess stock will involve unnecessary locking up of capital & prevent its availability for more profitable use.

c) Excess stock will increase the cost of storage, which directly effects on production / selling cost by affecting efficient storekeeping.

d) Excess stock prevents management from taking advantage of price fluctuations and favourable market conditions.

While fixing maximum level following factors are taken in to consideration

- i) Consumption rate of the material
- ii) Time necessary to obtain the material
- iii) Amount of money available
- iv) Storage space available
- v) Market conditions
- vi) Seasonal price fluctuations
- vii) Economic ordering quantity
- viii) Need of buffer stock (safety stock)
- ix) Staff & other facilities available for maintenance of store

Formula for calculation of maximum level

$$McL = RoL + RoQ - (Mc \times MRop)$$

where McL = Maximum Level

RoL = Re-order Level

RoQ = Re-order Quantity

Mc = Minimum Consumption

$MRop$ = Minimum reorder point.

II) MINIMUM LEVEL

It is the point below which the stock in hand shall not be allowed to fall. This level is fixed so as to avoid the production stoppage due to the shortage of material. It is necessary to keep the stock in hand always little above the level. This level is fixed by taking in to consideration the lead time (the time required to obtain the fresh stock) & the rate of consumption of material. This level gives safety in production as the material can always be kept reserve as emergencies. Some times the stock at this level is known as **Emergency Reserve Stock**. In an any condition the level should not touch the Zero Level.

Formula for calculation of minimum level

$$\mathbf{MnL = RoL - (AvC \times AvLT)}$$

where MnL = Minimum Level

RoL = Re-order Level

AvC = Average rate of Consumption

AvLT = Average Leag Time

III) ORDER LEVEL (RE-ORDER POINT)

This is the quantity of the stock between maximum and minimum level. When the stock reaches this point it is necessary to take actions for replenish the stock. This level is little higher than minimum level.

Formula For Calculation of Re-order Level

$$\text{RoL} = \text{Mcrp} \times \text{McU}$$

where RoL = Re-order Level

Mcrp = Maximum re-order point

McU = Maximum Usage

IV) AVERAGE STOCK LEVEL

It refers to the average stock held by the organisation at a given period of time.

Formula For Calculation of Average-Stock Level

$$\text{AvSL} = 1/2 (\text{McL} + \text{MnL})$$

where AvSL = Average Stock Level

McL = Maximum Level

MnL = Minimum Level

IV) DANGER LEVEL

It is the stage below minimum level & at this stage it is necessary to take emergency actions to replenish the stock.

V) SAFETY STOCK LEVEL

Safety stock prevents stock-outs. It is important in uncertainty and delivery pattern.

3.1.9 DEMAND FORECASTING AND INVENTORY CONTROL NECESSITY

In general the forecasting is nothing but guessing but when the work of guessing is supported with some scientific methods based on certain principles of formulae. Accurate demand forecasting is essential for any system of inventory control. Generally the demand forecasting is based on following factors.

- i) Record of Past consumption.
- ii) Future Production Plan.
- iii) Normal consumption per unit of the output.

METHODS OF PRICING THE MATERIAL ISSUE

The different methods used for pricing the material issue may be enumerated as follows.

A) Methods based on cost

I) First In First Out (FIFO)

This method is based on the assumption that the materials which are purchased first are issued first. The price of the earliest lot

purchased is taken first and when that lot is exhausted the price of the next lot is adopted and soon.

Issues are priced at the same basis until the first batch received is used up.

Advantages :

- i) The valuation of closing stock tends to be nearer current market price as well as at cost.
- ii) No unrealised profits enter into the financial results.
- iii) This method is easy to operate if the prices do not fluctuate frequently.
- iv) This method is realistic in so far as its assumption that materials are issued to production in the order of their receipts.

Disadvantages

- i) The cost of consecutive similar jobs may differ simply because the prior job exhausted the supply of lower priced stock. This renders comparison between different jobs difficult.
- ii) The method may involve very lengthy process to calculations if the prices fluctuate quite frequently.
- iii) The issue price may not reflect current market prices and therefore, in times of rising prices, the charge to production is unduly low.

The FIFO method is most successfully used when ;

- a) The size and the cost of raw material units are large
- b) Materials are easily identified as belonging to a particular purchased lot and
- c) Not more than two or three different receipts are as a material card at one time.

II) Last in First Out (LIFO) :

This method is operates on the assumption that the latest receipts of materials are issued first for production and the earlier receipts are issued last i.e. exactly reverse process to FIFO. Usually however a new delivery is received before the first batch is fully used, in which case the new delivery price becomes the last in price and is used for pricing issue until the batch is exhausted or a new delivery is received.

Advantages

- a) The method keeps the value of issue close to the current market prices.

b) In periods of rising prices, the higher prices of the most recent purchases are charged to operations, thus reducing profit figure and resulting in a tax saving.

c) No unrealised profit or loss is usually more by using this method.

Disadvantages

a) This method does not confirm to the physical flow of materials.

b) The number of calculations complicates the stores accounts so increase the possibility of clerical errors.

c) The value of a stock may not be acceptable for income tax purpose because it differs from market value under the conditions of rising prices. FIFO method is generally considered better. This is so because under FIFO method reasonably correct effect of current prices is reflected in the cost and the cost is not understand.

III. BASE STOCK PRICE :

This is the adoption of any pricing method keeping a fixed minimum volume of material at all times at a fixed price regards of the price fluctuations. The minimum stock is valued at long-run normal prices and may be carried at fixed assets, while the

stock in excess of the base stock is priced on some other basis. Usually cost or market value, whichever is lower. It is not used unless an emergency arises. This method is usually adopted in industries having the following characteristics.

- a) When raw materials being produced are basic and for the similar type of kind.
- b) When cost of finished product is made up largely of some basic raw materials.
- c) Long period of processing and keeping fixed stock of raw materials in process.

Advantages

- a) Less work is involved in computing inventory values at the end of the accounting period.
- b) In this process, result is more stable.
- c) Inventories are shown in the balance sheet at a very conservative or moderate value.

Disadvantages

- a) Statement of P & L is misleading and contrary to fact because it fails to recognise gains and losses on inventories.
- b) Value shown in the balance sheet are under value so it shows misleading position of capital.
- c) Base stock is not a fixed asset.

IV. SPECIFIC PRICE :

This is the price actually paid for the material bought. This method is useful where materials used can be specifically identified with a job. This applied for non-standard items have to be purchased to meet a particular customers specification.

Advantages

- a) It is particularly suitable for specific and non-standard product.
- b) From the point of view of costing, it is the most desirable method.

Disadvantages

- a) It is not suitable method, if the purchases and issues are numerous.
- b) Where the issue is made before the supplier's invoice has been received, the pricing will be delayed until the price is available. Thus it has a very limited practical application.

V) HIGHEST-IN-FIRST-OUT PRICE (HIFO)

The basic thought behind this method is that it is desirable to keep the inventory value of materials at the lowest possible price and consequently the highest priced materials are treated as being issued first, respective of the date of purchases.

Advantages

a) On a fluctuating market the highest cost of materials is recovered first and closing stock value is conservative.

Disadvantages

a) But like LIFO and FIFO, the amount of detail required in the records.

VI) NEXT-IN-FIRST OUT (NIFO)

Under this method material issued is priced at the rate which is for next lot. This method is normally not applied in practice to certain extent. This methods are weighted average because the rate is available at the time receive of material and not at the time when material is actually issued.

Advantages

- a) Simple to understand.
- b) As it is based on cost profit and loss is not likely to arise properly.
- c) Under inflationary conditions material will be to production at higher rates and possibility of over-stating profit is minimised.

Disadvantages

- a) Revenue authority may not accept this method for inventory valuation.
- b) Time gap between two successive receipts leads to suspension of work till the time of next proceeds.
- c) Material issue at the end of the accounting period and subsequent receipt in the next accounting period basis on the principle of magic.

B) METHODS DERIVED FROM COST

I) Simple Average Price

This is the price which is calculated by deciding the total of the prices of materials in the stock from which the material to be priced could have been drawn, by the number of prices used to calculate the average price. This method is useful where there is a little variation in purchase prices.

Advantages

- a) It is easy to calculate the price at which issues are to be made.
- b) There is no effect or not so much effect on the price of higher or lower rate of purchases.

Disadvantages

- a) This method neglect that the quantities held at each price, it may produce absurd results.
- b) As materials are not charged out at actual cost, a profit or loss on material will usually arise.
- c) The value of closing stock is absurd.

III) WEIGHTED AVERAGE PRICE :

It calculate by deciding the total cost of material in the stock from which the material to be priced have been drawn by the total quantity of material in the stock. In this method, it traced very well on the relative weights. It is not limited to materials of stable price as in the case of simple average method. It is quite different from all other methods, because less price is calculated on receipts of material not on issue of materials. When new lot of material is received a new price is to be calculated and all the issue are made at this price till the next lot is not received.

Advantages

- a) This method is advantageous where the prices vary widely, assets use events out the effect of these wide variations.
- b) This method is very simple for using and calculating the prices.
- c) This is useful for financial accounts also.

Disadvantages

- a) A profit and loss in issue may be incurred as in simple average price.
- b) There is no accurate information we get at time of large quantity is issued or received.
- c) As with LIFO or FIFO, this method calls for many calculations where receipts are numerous.

III.MOVING SIMPLE AVERAGE PRICE

It calculated by dividing the total of the periodic simple average prices of a given number of periods (including and preceding the period in which the material to be priced is used by the number of periods. The moving average price makes use of number of periodic simple average prices, the last of which is that of the period in which the material is used.

Advantages

- a) Extreme fluctuations in material prices are dampered by using this method and charges to work in progress are stabilised to some extent.
- b) High or low price paid sometimes in the past are removed from the computation and do not influence the average after 3,5,or 7 months.

Disadvantages

- a) In conditions of rising prices, a material losses is usually sustained and in conditions of falling prices a material profit is usually made.
- b) In case of rising prices, the stock is abnormally over valued and will not be accepted for preparation of balance sheet.

IV. MOVING WEIGHTED AVERAGE PRICE

Moving weighted average price which is calculated by dividing the total of the periodic weighted average prices of a given number of periods by the number of periods. This average price is calculated in exactly the same way as the moving simple average price with one exception namely that the periodic weighted average prices, and not the periodic simple average prices are used in this calculations.

V. PERIODIC SIMPLE AVERAGE PRICE

It calculated by dividing the total of the materials purchased during the accounting period in which the material to be priced used by the number of prices used to calculate the average price. This method is similar to the simple average price, with the exception that it is calculated periodically and not on the

occasion of each issue of material. As those is only calculation at the end of the period concerned, this method is extremely simple to operate the period.

Advantages

- a) This method is extremely simple to operate.
- b) This method can useful for employees in costing continuous process where each individual order is absorbed into the general cost of purchasing large quantity of articles.

Disadvantages

- a) The method is unsatisfactory in jobbing industry where each individual order must be priced at each stage up to completion.
- b) A loss or profit of material is arise due too use of this price and the valuation of stock may be to some extent absurd.

VI. PERIODIC WEIGHTED AVERAGE PRICE

It is calculated by dividing the total cost of material purchased during the accounting period in which the material to be priced is used, by the total quantity of material purchased during that period.

$$\text{Weighted Average Price} = \frac{\text{Total of Purchases} \quad \text{Periodic}}{\text{Quantity Purchased}}$$

This method is takes into consideration both the prices paid and the quantities purchased at each price during a particular period. For this reason it can be successfully used where the prices paid during a period fluctuate substantially.

Advantages

- a) Unlike weighted average price, this method is easy to operate, the only calculations of issue price occurring at the end of the period concerned.
- b) This method is useful to employed in industries where the prices of materials fluctuate considerably.
- c) It can also be advantageously used in process industries.

Disadvantages

- a) This method is unsatisfactory in job order costs where each individual order must be priced at each stage upto completion.
- b) The pricing of materials issued requires to be delayed until the end of an accounting period and by doing so, heavy burden is thrown on the clerical staff at the end of the year.

C. NOTIONAL PRICE

I) Standard Price

A standard price is a predetermined price fixed on the basis of a specification of all factors affecting price. The following factors may be considered necessary while fixing predetermined or standard price. The quantity of materials in hand to be normally purchased, the rate of quantity discount.

b) The existing price and price which is expected to be paid for the materials including and excluding freight and warehousing expenses.

c) Any other factor which is required to be considered in particular circumstances.

A standard price for each material is set and the material price paid is compared with the standard.

Advantages

a) This method is relatively easy to operate.

b) Comparing the actual prices with the standard prices, the efficiency of purchasing department can be determined.

c) The effect of price variations is eliminated from the job or process costs and satisfactory comparisons can be made .

d) It reduces clerical costs by the elimination of detailed cost

records of materials and the repeated calculation of unit prices.

Disadvantages

- a) Issues may not be at the current economic values.
- b) The trend of the prices may not be reflected.
- c) The method requires careful initial determination of the standard price.

II) REPLACEMENT PRICE

Replacement price is the price at which, on the date of the material, these could be purchased another date of material identified to that whose issue is being priced. Under this method, therefore, the issues are priced at the market rate on the date of its issue.

This method proposes the determination of replacement cost of material at the time of each issue which may involve considerable work.

Advantages

- a) As far as calculations are concerned the method is simple to operate.
- b) The issues are priced at the current market price.

Disadvantages

- a) The replacement cost may not be easily available because the current quotations are not easily available or not available at all current prices may, therefore, have to be estimated.
- b) Issues are not priced at actual cost.
- c) The inventory valuations will not be at current market prices.
- d) The method introduces at demand of unrealised profit or loss.

III. INFLATED PRICE

Certain wastages in storage is inevitable due to evaporation and moisture which is called normal wastage. This wastage must be recovered from production. Such percentage is as necessary to recover the total cost of materials purchased for i.e. 100 units of a material are purchased for Rs.180 and if out of these 90 units can be normally used, issues will be priced not @ Rs.1.80 per unit but at the rate of Rs.2.00 per units.

IV RE-ISSUE PRICE

When value of material in its re-use then this method is used. Occasionally, rejected material returned to stores are re-issued to other departments for an alternative use. When this is done, the price, bearing a close relationship to the price paid for the material normally purchased and used for the purpose to which

the material re-used is adopted, is probably different from the price paid originally for the re-used material. Usually a material loss is incurred by the use of the re-use price.

ECONOMIC ORDER QUANTITY (EOQ)

The concept of Economic Order Quantity was first developed by F.Harris in 1916. Economic Order Quantity is referred to as the size of the order that given maximum economy in purchasing the materials. It is also known as optimum or standard Order Quantity. In fact EOQ offers solution to inventory problems. It help in finding opportunities levels for holding inventories. It facilitates the fixation of ordering sequence and the quantities so as to minimise the total materials cost. Before taking EOQ decision the following costs are considered and analysed.

a) ORDERING COST

It is the cost of placing an order and securing the supplies. The ordering cost depends on i) the number of orders placed during a given period ii) the number of items ordered at a particular time is the frequency of orders placed and the size of the order. The more frequently the orders are placed and lesser the size of the order, higher will be the ordering cost and vice versa.

b) INVENTOR CARRYING COST

It is the cost of keeping the materials in the storehouse which includes (i) Capital Cost (ii) Storage and handling Cost (iii) Cost of deterioration and obsolescence (iv) Other kinds of losses and damages during storage. The volume of inventory directly affects the inventory carrying cost. The longer the volume of inventory, the higher the inventory carrying cost and vice versa.

c) INADEQUATE INVENTORY COST

It is the cost which includes (i) Cost of expediting the purchases (ii) Cost of securing rush deliveries (iii) Follow-up cost etc. This inadequate cost does not directly affect the EOQ but it certainly affects the operation of the organisation and thus affects the cost.

The above three costs which influence the economic order quantity may be broadly clarified into two categories.

- i) Cost of Acquiring Materials.
- ii) Cost of Holding the Materials.

In order to control the cost properly and increase the return on investment it is necessary that these two costs should be managed and controlled judiciously. An EOQ may be fixed at a point where the aggregate of the two above mentioned costs is at their minimum and this can be done with the help of following formula.

$$EOQ = \sqrt{\frac{2Q \times C_p}{S_c}}$$

Where Q = Quantity on Units Purchased in a given period.

C_p = Cost of placing an order.

S_c = Storage Cost per unit per year.

TOOLS AND TECHNIQUES OF SCIENTIFIC INVENTORY CONTROL SYSTEM

Inventories in an organisation can be controlled in various ways. For example one method is to keep an up-to-date record of receipt of issue of inventory items. This method is known as Perpetual Inventory System. Another method is to find the optimum order quantity of each item to be stocked. Thus EOQ is

based on the rate of demand, lead time for replenishment and related costs.

But, as we know that every organisation consumes several items of store. Since all the items are not of equal importance, a high degree of control on inventories of each item is neither applicable nor useful. So, it becomes necessary to classify the items in groups depending upon the principle of selective control which is applied to control inventories.

Following are the few techniques of selective control.

ABC ANALYSIS

ABC analysis is a basic tool which helps the management to place their efforts where the results would be useful to the greatest possible extent. ABC analysis is the selective approach popularly known as always (A) Better (B) Control (C) It always controls the best, then better and lastly the good. ABC analysis is a very effective tool for selective control. This technique involves the classification of inventory items into three categories A, B, & C in descending order of annual consumption and annual monetary value of each item.

(i) Category A Items

More costly and valuable items are classified as A such as items have large investments but not much in number i.e. 10 % of items account for 75 % of total capital investment in inventory. So, more careful and closer control is needed for such items. The items in this category should be ordered frequently but in small number.

(ii) Category B Items

The items having average consumption value are classified as B. Nearly 15 % of the items in an inventory account for 15 % for the total investment. These items are lesser importance than "A" class items but are much closely to pay more attention on their use, statistical sampling is generally used to control them.

(iii) Category C Items

The items having low consumption value are put in category C. Nearly 75 % of inventory items accounts only for 10 % of the total invested capital.

ADVANTAGES OF ABC ANALYSIS

Following are the advantages of ABC method of inventory control.

- (i) It becomes possible to concentrate all efforts in areas which need genuine efforts.
- (ii) It gives rewarding results with minimum control.
- (iii) As it is based on selective approach. It is most effective economical.
- (iv) It saves time, money & labour without hampering production schedule.
- (v) It avoids unnecessary stock or surplus stock.

STEP BY STEP PROCEDURE FOR ABC ANALYSIS :

The following are the steps for ABC classification.

1. Determine no.of Units used in the past one year.
2. Calculate unit cost for each item.
3. Compute the annual usage value (in Rs.) of each item consumed which is product of price x No.of units consumed.
4. Arrange these items in a descending order according to usage value.
5. Prepare a table showing unit cost, annual consumption and annual usage value for each item.
6. Obtain cumulative total No.of items and usage value.
7. Convert the percentge of the values obtained with respect to the grand total of corresponding column.
8. Plot a graph by taking % of items on X-axis and corresponding usage value % on Y - axis.
9. Identify the cut off points X and Y where the curve sharply changes its shape. This provides three segments corresponding to these points classifying the items as A,B & C.

In present study it is observed that in Stores department No. of items carrying the inventory are huge in amount and it is not possible to plot the graph. In such a case hardly 5-10 % of the total items account for 70-75 % of the total money spent on the materials, 10 - 20 % of the total items represents 10 - 15 % of the total expenditure (B-class) and remaining 70 - 80 % of the total items in expensive (hardly 5 - 10 % of total expenditure) classed in "C" category.

VED ANALYSIS :

VED analysis represents classification of item based on criticality. The analysis classifies the items into the three groups called Vital, Essential and Desirable. It is largely applicable to spare parts.

To ensure smooth plant operation, vital spares are stocked adequately . Vital spares are those items, non-availability of which halts the production.

Essential group includes items whose stockout cost is very high. These items can be sufficiently stocked to ensure a regular flow,

for efficient production cycle. It is therefore necessary to have adequate arrangement for its replenishment at a short notice.

Desirable spares are those which can be easily bought from the market as and when they are needed by the organisation. The lead time of such items is low and their procurement at any time is not going to pose any problem or immediate loss of production.

VED analysis is useful in stock controlling of spares parts required for maintenance. Since this analysis is based on criticality it can be used for rarely available raw materials.

STEPS INVOLVED IN MAKING VED ANALYSIS :

1. Identify the factors as a) effect on production b) lead time c) nature of item and (d) source of supply.
2. Assign points/weightages to the factors according to their importance to the company.
3. Divide each factor into three degrees and allocate points to each degree. The points assigned the 1st, 2nd and 3rd degree are equal to weightage of its factor, twice and thrice the weightage of its factor.

4. Prepare classification table and evaluate items one by one against each factor and assign points to the item depending upon the extent presence of the factor in the item.

5. Place the items into V.E. & D categories depending upon the points scored by them.

VED analysis is best suited for spares inventory. It is advantageous to use more than one method. ABC & VED analysis together would be helpful for inventory control of spares.

F-S-N ANALYSIS :

FSN analysis is based on the consumption figures of the items. The items are classified as fast moving (F) , Slow Moving (S) and Non moving (N) . This analysis is useful in case of obsolete items. Previous years issues is the guiding factor for FSN method.

Previous two/three years issues are generally taken into consideration for a decision of FSN. If there are no issues during past few years they will be classified as "S" items. Items being issued more than 15 times a year may be placed in "F" category. FSN analysis and limits of issues vary from one organisation to another.

This analysis helps in avoiding investments in non moving and slow moving items. FSN analysis is also useful to control obsolete items which is useful in the timely prevention of obsolescence.

BENEFITS OF SCIENTIFIC INVENTORY CONTROL

Experience indicates that through a scientific system of inventory control, the stocks can be reduced by anywhere between 15 % to 60 % and critical shortages substantially reduced. Few more benefits of scientific inventory control are :

- i) Ensures an adequate supply of items to the customer and avoids the shortages as far as possible at the minimise cost.
- ii) Makes use of available capital (and/or shortage space) in a most effective way and avoids an unnecessary experience on high inventories.
- iii) Reduces the risk of loss due to the changes in prices of items stocked at the time of making the stock.
- iv) Provides cushion between work centres thereby assures a smooth and efficient running of the organisation.
- v) Takes advantage of quantity discounts on bulk purchases.
- vi) Serves as a buffer stock in case of delayed deliveries by the suppliers. In other words it ensures against scarcity of materials in the market.
- vii) Eliminates the possibility of duplicate ordering.

viii) Helps in maintaining economy by absorbing some of the fluctuations when the demand for an item fluctuates or is seasonal.

ix) Controls and minimizes accumulation and build-up of surplus stocks and eliminates the dead surplus and movable surplus stock as far as practicable.

x) Utilizes the benefit of price fluctuation. Hence, in conclusion with a good inventory, a firm is able to make purchases in economic lots, maintain continuity of operations avoid small time consuming orders and guarantee prompt delivery of finished goods.

xi) Many situations, inventory control ensures a two fold advantages etc. by increasing profit.

In addition to above Computerised Scientific Inventory Control has following benefits.

- i) Regular and proper feed back.
- ii) Effective Management Control over inventory.
- iii) Electronic data processing system handles data promptly in the quickest possible time.
- iv) Clerical cost is kept to the lowest possible minimum.

- v) Voluminous data required to be processed repetitively can be dealt with ease.
- vi) Where the data involve too many uncertainties that render manual calculation an almost impossibility, computers may be installed to handle the task with ease.
- vii) Data can be processed in a better form not previously available almost a unlimited variety of analytical reports and returns and answers to problems may be turned out.
- vii) Computers can give quick solutions to optimisation problems where decision rests on a large number of factors involving their permutation and combination in numerous ways.
- ix) Accuracy and reliability of both input and output are ensured. The importance given to input leads to better recording of data and there is a practically no risk of any errors in the output.
- x) Work flow in electronic data processing is smooth. When proper programmed, the computer gives un-interrupted for hours.
- xi) Time taken for doing a job in the computer is more accurately assessed and schedules are always achieved. These improve work performance.

3.2 PROFILE OF THE MAHALAXMI CATTLE FEED PLANT, GADMUDSHINGI (GOKUL)

INTRODUCTION

The Kolhapur District Co-operative Milk Producer's Union Ltd, Kolhapur established 16th March 1963, under Co-operative Societies Act. (Regd.No. KPR-PRD [A] 102) made a moderate beginning by collecting 700 litres of milk per day from 22 societies. The main objective of the Sangh during the formative years was to collect the milk from primary societies and supply it to the Government dairy in Tarabai Park, Kolhapur.

In 1978, The National Dairy Development Board (NDDB) included Kolhapur District under Operation Flood Area and this was beginning of new era for Dudh Sangh. The project was formalised by NDDB. The NDDB constructed 2 lac litres per day capacity Dairy Plant at Gokulshirgaon, 75,000 litres/day Chilling Centre at Gadhinglaj and 50,000 litres/day Chilling Centre at Bidri (Borawade). Two more chilling centres i.e. at Gogave in Shahuwadi Taluka & Tawarewadi in Chandgad Taluka constructed under Operation Flood - III. The chilling plants constructed

under Operation Flood -III will start their actual function within short period.

Under Operation Flood-I 100 MT/day Mahalaxmi Cattle Feed Plant established in 1982 at Gadmodshingi by NDDB and the expansion of Cattle Feed Plant from 100 MT/day to 200 MT/day has been completed during March 1993 under the financial assistance of NDDB under Operation Flood -II.

The dairy was commissioned towards the end of 1985 and with the help of NDDB the Government Milk Scheme in Kolhapur was handed over to the Kolhapur Dudh Sangh in Mid 1985. During the year 1985, the average milk procurement was 1,14,836 litres per day and 676 Primary Milk Producer Societies affiliated to the Dudh Sangh. There after rise in procurement every year has been very fast and in 1995-96 the average milk procurement is 14,20,52,272 litres with 1768 Primary Milk Producer Societies affiliated to the Dudh Sangh.

Since 1989-90 onwards the Union is getting First Best National Productivity Award in Milk Product Plant, Co-operative Sector

Liquid Plant, Dairy Processing Industry, Co-Operative & Public Sector (Product Plant).

3.2.1 AREA OF OPERATION

The area of operation of the Dudh Sangh covers whole Kolhapur District with all the Twelve Talukas i.e.

- i) Karvir ii) Kagal iii) Chandgad
- iv) Gadhinglaj v) Ajara vi) Radhanagari
- vii)Panhala viii) Shirol ix) Hatkanangale
- x) Bhudargad xi) Gaganbawada xii) Shahuwadi

However, 41 villages from Hatkanangale and Panhala are affiliated to Warna Dudh Sangh Limited, Amrutnagar in Panhala Taluka.

The total capital expenditure of the Dudh Sangh is Rs. ^{236 Crores.} ----- lacs.

The total number of membership are 1848 of which 'A' class members are 1768 and "C" class members are 80. The total authorised share capital is Rs.5100 lacs. The deposits and investments is Rs.13,44,41,476/- & the Profit is Rs.1,96,67,610/- (All the figures are for the Financial Year 1995-96).

3.2.2 OBJECTIVES OF DUDH SANGH

- 1) To procure clean and quality of milk at main dairy and at chilling centres from the farmers and the primary societies in Milk shed .

- 2) To process and convert the received milk from Primary Milk Producer Societies into bi-product such as Milk Powder, Ghee, Butter, Table Butter and Shrikhand by keeping the commercial view.

- 3) To supply surplus milk to Mahananda Dairy, Bombay managed by Maharashtra Rajya Sahakari Dudh Mahasangh Maryadit, Bombay, Gokul Bombay Branch, Goa Milk Union and to other cities and towns for consumption of consumers.

- 4) To manufacture the balanced cattle feed for supply to the dairy cooperative societies in the Milk shed at reasonable prices.

- 5) To convert the dairy cooperatives into Anand Pattern.

6) To conduct the various training programmes to farmers as well as to dairy societies so as to improve the quality of milk and for maintaining the rate of growth of milk production in Milk Shed area of Dudh Sangh.

7) With a view to create awareness and encourage Lady Farmer Members in day -to-day activities of milk production & management of cooperative societies, separate cell called "Co-Operative Development Cell" is opened.

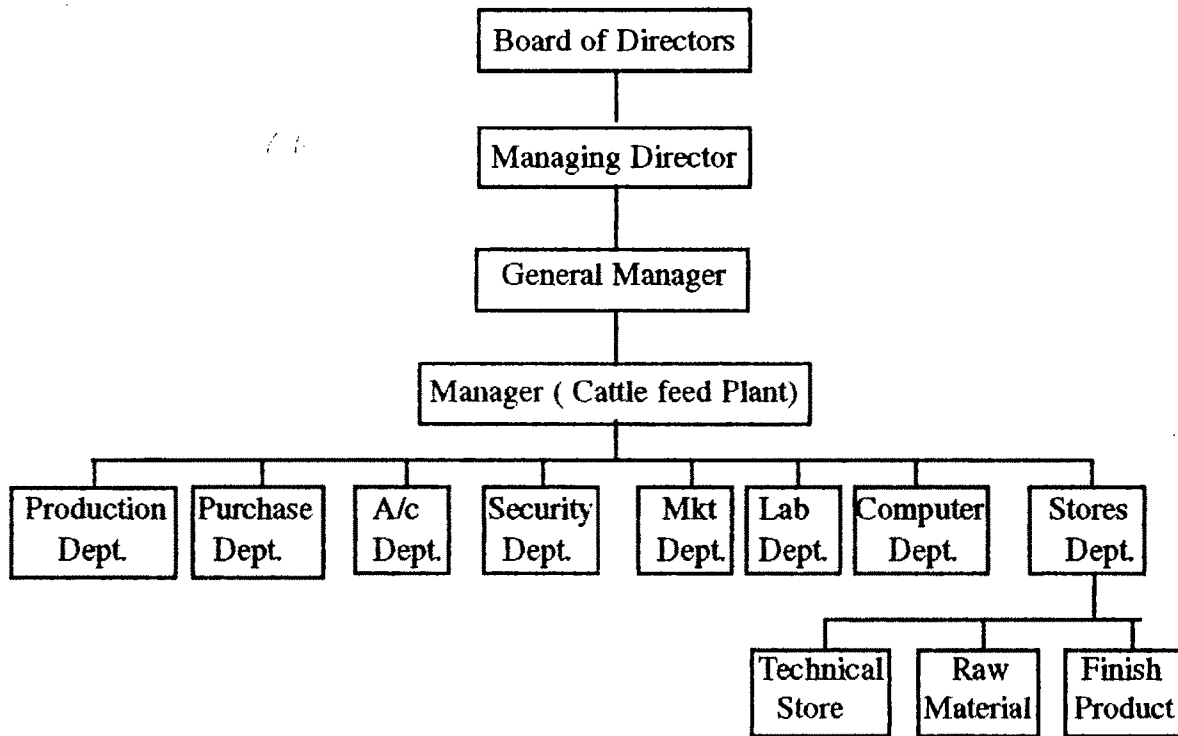
8) With the help of NDDB a training centre is established to train the Society Secretaries, Management Committees, First Aid and all works, milk testing etc. for effective management of Dairy Co-operatives. This facility is extended to the adjoining district milk union. All the activities are beneficial to the members of the milk union, farmers and others in Milk Shed area of Dudh Sangh.

3.2.3 MANAGEMENT

The Board of Directors' consists of 14 elected districts and 2 co-opted Women Directors and representatives of State Federation, N.D.D.B., & Dairy Development Commissioner as well as Dy.Registrar, Cooperatives. From the next General Election the two women seats would be reserved subject to regular election. The elected board has a tenure of 5 years. The Chairman is elected by Board of Directors every year. The Board meetings are regularly held on 10th, 20th and 30th of the month. The board is fully committed to its tasks.

The Board consists of 16 representatives of the Dairy Cooperatives, Managing Director appointed by State Government and all the representatives mentioned above.

The Heirarchiacal structure of the Mahalaxmi Cattle Feed Plant is as below.



3.2.4 MAHALAXMI CATTLE FEED PLANT, GADMUDSHINGI

Mahalaxmi Cattle Feed Plant established in 1982 so as to supply the balanced cattle feed in reasonable prices to Primary Milk Producer Societies for improvement of milk in quantity and in quality. The plant started producing compound cattle feed in Pellet & Mash form under brand name of Mahalaxmi Special Milk Ration on 13.01.1982.

For achieving the best quality cattle feed to the animals, the Management follows specification recommended by NDDDB, Anand as follows.

3.2.6 BY PASS PROTEIN FEED

Crude Protein	- 25.0 % Minimum
Ether Extract	- 2.5 % Minimum
Crude Fiber	- 9.0 % Maximum
Sand Silica	- 2.0 % Maximum
RDP	- 7.0 % Minimum
UDP	- 15.0 % Minimum
ME	- 10.5 % mj/kg
Calcium	- 2.0 %
Phosphorus	- 1.0 %
Vit 'A'	- 10,000 IU/KG
Vit 'D'	- 1,000 IU/KG

DCP	= Digestable Crude Protein
TDN	= Total Digestable Nutrients
RDP	= Rumen Degradable Protein
UDP	= Undegradable Protein
ME	= Metabolizable Energy

The NDDDB has supplied a software package for taking the suitable feed formula based on LPP. With the help of software package based on LPP the formulation is carried for day-to-day production.

The installed capacity of the Unit was 100 MT/day as against cattle feed demand of 150 M.T/day from district cooperative milk societies in the Milk Shed area of Dudh Sangh. In spite of limitation of manufacturing capacity the available plant capacity was utilised to the maximum possible extent by excellent management.

To cater to growing demand of cattle feeds in Kolhapur Milk Shed and to fulfill the gap between demand and production of cattle feed, the Milk Union Management forced to adopt following methods.

- i) Direct Purchases of cattle feeds as per product specification.
- ii) Processing of cattle feeds with other cattle feed plant in Private/Co-Operative Sectors as per Product Specification.

Due to better demand of cattle feed from the Milk Producers in the Milk Shed, Management was decided to expand capacity from 100 MT/day to 200 MT/day cattle feed plant and the expansion from 100 MT/day to 200 MT/day is completed in March 1993.

Presently the plant is receiving 200/250 MT/day demand from Primary Milk Producer Societies and day by day demand of cattle feed is increasing. To overcome the situation, the Management has taken following remedial actions.

- i) Reduction in Production cost of Milk.
- ii) Reduction in Cattle Feed Consumption/litre of milk in comparison with ordinary low protein feeds.
- iii) Reduction in total demand of By-pass Protein Feed in comparison with ordinary feeds (low Protein).

To exploit the above benefits and to meet the growing demand in comparison with milk production, management has taken decision to switch over to 100% production of By-pass Protein Feed during the year 1992-93. Due to analytical outcomes it is proved that the cost of production of milk has considerably reduced at milk producer level in the Milk shed due to Bypass Protein Feed.

The Milk Union started manufacturing of Mineral Mixture for breeding efficiency as well as to increase milk production. The Management is getting maximum production by utilisation of plant capacity to the maximum possible extent due to following measures.

- i) Proper Preventive Maintenance.
- ii) Optimum utilisation of power/fuel/water.
- iii) Efficient production, planning and scheduling.
- iv) Introduction of Computerised Batch Weighing System.
- v) Use of Auto Operation.
- vi) Training of Operator/staff for proper utilisation .

The effect of maximum utilisation, planning and scheduling in production and sales results in increase in production, sale and capacity utilisation clears from the following table.

Year	Total Production	Total Sale	Capacity
	(M.T.)	(M.T.)	
1990 - 91	31,968.736	33,584.040	111.09
1991 - 92	32,022.875	41,582.866	108.00
1992 - 93	38,934.155	44,332.425	129.78
1993 - 94	46,555.765	49,341.960	74.34
1994 - 95	47,755.102	51,783.778	78.54
1995 - 96	51,688.823	58,162.213	81.01

All the production batches are carried out as per following Bypass Feed Formula.

3.2.7 RATIONAL SPECIFICATION FOR BY-PASS PROTEIN FEED

Ingredients	Commodity	Range
Grains	H.Jowar, Maize	8 - 10 %
Brans	R.P.Fine, D.O.R.B.	20 - 30 %
Oil Cakes & De oil Cakes	G.N.Cakes, Cotton DOC, S.F.DOC, Soya DOC, Maize Glutin	50 - 60 %
Unconventional	Rape DOC, TSP	27 % Maximum
Unpalatables	Rapeseed Ext	20 % Minimum
Mineral Mixture & Vitamins		1.5 % Minimum
Additives		5.0 %
Molasses		6 - 10 %

Mahalaxmi Cattle Feed Plant is only in Maharashtra which is manufacturing and selling 100 % By-pass Protein Feed and gives door delivery to the Primary Milk Producer Societies in the Milk Shed Area.

3.2.8 RESEARCH & DEVELOPMENT

i) To improve the quality of final product the Milk Union have started micro and macro analysis of the raw materials.

ii) Aflatoxin Analysis - RDP and UDP analysis of raw materials, which improves quality of final product.

iii) The Milk Union have developed the Counter Current Flow Cooler for proper cooling of final product to maintain minimum moisture percent.

iv) The Milk Union has controlled their process losses by installation of Computerised Batch Weighing System and by recovering the fine particulates from Aspiration System.

3.2.9 COMPUTERISATION

In 1987 the Milk Union Management has decided to start their own computer section and introduced first two PC/ATs (386) in Mahalaxmi Cattle Feed Plant.

At present the computer section of Cattle Feed Plant is having LAN Network (ETHERNET 4.01 VER) and all the departments are computerised except technical store & production department. The computerisation of production department is in progress. All the software developments has been made by the computer section of Mahalaxmi Cattle Feed Plant.

3.3 PRESENT REPORTING PROCEDURES OF THE UNIT :

All the departments involved in production prepares summery of data i.e . Daily Production, Production of various product, Sales summery, Breakdown report, Flash Report representing the total production and sales etc. reports to the Manager, Cattle Feed Plant and Manager , CFP sent the accumulated report summery to Chairman, Managing Director, General Manager, M.I.S., and other related departments.

These reports are as follows :

1. DAILY REPORTS :

- a) Cattle Feed Production.
- b) Cattle Feed Sale.
- c) Breakdown Report.
- d) Raw Material Purchases.
- e) Finished Product Godown Dispatch.
- f) Summery Report of cattle feed production and sales.
- g) Loss and Gain Report.

2. 10 DAY REPORTS :

- a) Cattle Feed Profuction and Sale.**
- b) Plant Effeciency Utilisation.**

3. MONTHLY REPORTS :

- a) Cattle Feed Production & Sales.**
- b) Raw Material Consumption Report.**
- c) Raw Material Purchase Report.**