Material

Introduction

Material is an important element of cost, truly speaking, the most important and significant element of cost in a manufacturing concern. The manufacturing concerns remove the hindrance involving shape, size or structure of the natural elements which cannot be used by human beings for the satisfaction of their needs. These elements are converted into consumable goods or valuable resources through these concerns. In input-output system, manufacturing concerns use different materials as input and after following the manufacturing procedures in systematic way different goods or services come out as output. So the output is the result of input or materials. The visible elements of an output are actually the elements of different materials, although there are different types of costs found in a cost statement.

Meaning and Concept of Materials and Inventory:

A. ***Materials:***

According to the ***Terminology*** *of ICMA*, London, materials are "the commodities supplied to an undertaking". These are the physical elements employed in the production process and consumed during the course of conversion into the output. But the output may be of two types — such as (i) Physical Goods, Finished Product or Tangible Output, and (ii) Services or Intangible Output.

So, materials are the real and physical resources used in different stages of production as inputs for conversion into the finished goods or for rendering of services. Although materials are mainly related to production activities, the physical elements consumed or required in performing office & administration, selling, and distribution functions are also considered as materials.

For example – Wood, nails & screws, gum, colour etc. in a carpentry shop; cloth, threads bottom etc. in a tailoring shop; raw jute, water, chemicals etc. in jute mill; iron ore, manganese, lime stone dolomite etc. in a steel factory are the materials.

1. Formulae on Stock Levels :

A. Re-Ordering Level = Maximum Usage / Consumption × Maximum Delivery / Reorder Period (Lead Time) = Ma. U × Ma. D

or, Re-Ordering Level = Minimum Level (or Safety Stock) – Average Usage × Normal Delivery Period = ML – AU × ND.

B. Maximum Level = Re-Ordering Level + Re-Order Quantity – Minimum Usage × Minimum Delivery Period = RL + RQ – Mi. U × Mi. D.

C. Minimum Level = Re-Ordering Level – Average Usage × Normal Delivery Period = RL – AU × ND.

D. Danger Level = Normal Usage × Urgent Delivery Period = NU × UD.

E. Average Level = Minimum Level – ½ × Re-Ordering Quantity = Mi L – ½ RQ,

or, Average Level = ½ (Maximum Level + Minimum Level)

N. B. : *Average Usage = Normal Usage = ½ (Maximum Usage + Minimum Usage).*

Average Deliver Time ½ (Maximum Delivery Period + Minimum Delivery Period)

2. Formulae of Economic Order Quantity (EOQ) :

A. EOQ (in units) = $\sqrt{\frac{2UO}{C}}$ Where, U = Annual Usage / Consumption (in Units)

O = Ordering Cost per Order (in Rs.)

C = Carrying Cost per unit per year (in Rs.)

B. EOQ (in Rs.) = $\sqrt{\frac{2UO}{C}}$ Where, U = Annual Usage / Consumption (in Rs.)

O = Ordering Cost per Order (in Rs.)

C = Rate / Percentage of Carrying Cost per year.

N. B. : ***If price of material is not fixed or discount is available on bulk purchases, then EOQ can not be computed by this formula.***

C. Optimum No. of Orders (per year) (Or Frequency of Orders) = $\frac{U}{EOQ}$.

D. Time gap between two consecutive orders = $\frac{\text{365 Days or Annual working Days or 12 months}}{\text{No. of Orders}}$

E. Total Carrying Cost per year = Average Stock × Carrying Cost per unit per year

= ½×Re-Ordering Quantity × Carrying Cost per unit per year = $\frac{EOQ}{2} \times C$.

F. Total Ordering Cost per year

= No. of Orders × Ordering Cost per order = $\frac{U}{EOQ} \times O$.

G. Total of Carrying Cost and Ordering Cost

$$= \frac{EOQ}{2} \times C + \frac{U}{EOQ} \times O = \sqrt{2UOC}.$$

3. Inventory / Stock Turnover Ratio :

A. No. of Stock Turnovers (in a year) = $\frac{\text{Value of Stock / Material Consumed in a year}}{\text{Average Stock}}$

B. Stock Turnover Period (in a year) = $\frac{\text{365 days / Working Days / 12 months}}{\text{No. of Stock Turnovers}}$

4. Average Price of Material :

A. Simple Average Price = Average of Price Rates (for available lots) = $\frac{\Sigma P}{n}$.

B. Weighted Average Price = Average of Values for (available) Materials = $\frac{\Sigma PQ}{\Sigma Q}$.

[P = Price of Individual Lots, Q = Quantity of Individual Lots, n = No. of Items.]

Illustration L9 : (a) EXE Ltd. has received an offer of quantity discounts on its order of Materials as under :

Price per tonne (Rs.)	*Tonnes*
1,200	Less than 500
1,180	500 and less than 1,000
1,160	1,000 and less than 2,000
1,140	2,000 and less than 3,000
1,120	3,000 and above

The annual requirement for the material is 5,000 tonnes. The ordering cost per order is Rs.1,200 and the stock holding cost is estimated at 20% of material cost per annum.

You are required to compute the most economical purchase level.

(b) What will be your answer to the above question if there are no discounts offered and the price per tonne is Rs.1,500 ? ***[C.A., Inter]***

Solution : The Most Economical Purchase Level means the Economic Ordering Quantity (EOQ). As price of materials varies (or discount rate changes) to different ordering sizes, the EOQ can be determined by Trial & Error Method through a statement.

Statement showing computation of the most economical purchase size under Trial & Error Method for the year.....

I	No. of Orders for the year	1	2	4	*5	8	10	20
II	Annual Requirements (in tonnes)	5,000	5,000	5,000	5,000	5,000	5,000	5,000
III	Ordering Quantity (in tonnes) [II / I]	5,000	2,500	1,250	***1,000**	625	500	250
IV	Average stock held (III / 2)	2,500	1,250	625	500	313	250	125
V	Purchase Price per tonne (in Rs.) (as per given table)	1,120	1,140	1,160	1,160	1,180	1,180	1,200
VI	Total Purchase Cost (in Rs.) [V×II]	56,00,000	57,00,000	58,00,000	58,00,000	59,00,000	59,00,000	60,00,000
VII	Ordering Cost per Order (in Rs.)	1,200	1,200	1,200	1,200	1,200	1,200	1,200
VIII	Total Ordering Cost (in Rs.)	1,200	2,400	4,800	6,000	9,600	12,000	24,000
IX	Carrying Cost per tonne per year (in Rs.) [20% of V]	224	228	232	232	236	236	240
X	Total Carrying Cost (in Rs.) [IV×IX]	5,60,000	2,85,000	1,45,000	1,16,000	73,868	59,000	30,000
XI	Total Inventory Cost (in Rs.) [VI+VIII+X]	61,61,200	59,87,400	59,49,800	**59,22,000**	59,83,468	59,71,000	60,54,000

From the above comparative statement for different order sizes, we find that minimum/ economic total inventory cost is Rs.59,22,000 and its corresponding order size is 1,000 tonnes and number of orders is 5. So the most economical order size is 1000 tonnes.

(b) We know under fixed material price system, the most economical purchase size (EOQ)

$= \sqrt{\frac{2UO}{C}}$ **units.**

Here, **U** = 5,000, O = 1,200, C = 20% of material cost per tonne of Rs.1,500 = Rs.300

So, **EOQ** $= \sqrt{\frac{2 \times 5,000 \times 1,200}{300}} = \sqrt{40,000} = 200$ tonnes.