ANALYSIS OF INVENTORY MODEL BASED ON GARMENTS

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***Abstract*: The concept used in this project is analysis of inventory model in Balaji Garments. From this inventory model concept we can find how much materials have to be ordered or sold per year by calculating this we can find our needs.**

***Keywords*: Optimum solution and EOQ.**

INTRODUCTION OF INVENTORY MODEL:

Inventory model is also referred as stocks are basically the goods and raw materials that any business would hold and are ready or will be ready for sale. Inventory model is a mathematical model that helps business in determining the optimum level of inventories that should be maintained in a production process, managing frequency of ordering, deciding on quantity of goods or raw materials to be stored, tracking flow of supply of raw materials and goods to provide uninterrupted service to customers without any delay in delivery.Inventory also referred as **stocks** are basically the goods and raw materials that any business would hold and are ready or will be ready for sale.

Inventory model can be defined as,
Independent demand: Finished goods, items that are ready to be sold.
E.g. T-shirt
Dependent demand: components of finished products.
E.g. Designs and stitching's that makes up a T-shirt.

In this model, we assume that we only have one product. Demand is known, and demand is constant throughout the year. This will allow us to develop a mathematical formula call **economic order quantity**, or **EOQ**. There are only two costs involved in this model: **ordering** cost which is the cost of ordering and receiving the items; and **holding** or **carrying costs and shortage cost** defined as the costs to carry an item in inventory for one year.

The Economic Order Quantity (EOQ) is the number of units that a company should add to inventory with each order to minimize the total costs of inventory. The EOQ provides a model for calculating the appropriate reorder point and the optimal reorder quantity to ensure the instantaneous replenishment of inventory with no shortages. It can be a valuable tool for small business owners who need to make decisions about how much inventory to keep on hand, how many items to order each time, and how often to reorder to incur the lowest possible costs.

EOQ model assumes that demand is constant, and that inventory is depleted at a fixed rate until it reaches zero. At that point, a specific number of items arrive to return the inventory to its beginning level. Since the model assumes instantaneous replenishment, there are no inventory shortages or associated costs.

PROBLEMS:
Problem 1:
To calculate the economic order quantity. And to find the order that have to be placed in a year.
Given:
Material consumption per annum: 7000Kg
Order placing cost per order: Rs 40
Cost per kg of raw materials: Rs 2
Storage costs: 6% on average inventory.
Solution:
Formula:

$$EOQ=\sqrt{\frac{2\times A\times O}{C}}$$

Where,
A= Unit consumed during year
O=Order cost per order
C=Inventory carrying cost per annum
A= 7000Kg
O= Rs 40
C=2×6%=Rs 0.12

EOQ= $\sqrt{\frac{2\times A\times O}{C}}$

EOQ= $\sqrt{\frac{2\times 7000\times 40}{0.12}}$

EOQ= 2160.2Kg.

No of orders to placed $=\frac{\textbf{Total consumption of materials per annum}}{\textbf{Economic order quantity}}$

$=\frac{7000kg}{2160kg}$

= 3 order per year

Therefore, 3 orders can be placed in a year.

Problem 2:

This was based on inventory with shortage .A commodity is to be supplied at a constant rate of 200 units per day .Supplies of any amounts can be had at any required time, but each ordering cost Rs 100, cost of holding the commodity in inventory will be Rs2 unit per day while the delay in the supply of the items induces the penalty of Rs 10 per unit per delay of 1 day.

1. Find the optimal policy.
2. What would be the best policy if penalty cost becomes ∞ ?

Solution:

Formula:

Optimal order quantity $Q^0 = \sqrt{\frac{2AR}{h}\left(\frac{h+\pi}{\pi}\right)}$

Optimum time cycle $T^0 = \sqrt{\frac{2A}{Rh}\left(\frac{h+\pi}{\pi}\right)}$

Where,

R= Supply rate of commodity

A=Ordering cost

h= Holding cost

$\pi =$ Penalty for delay

Given:

R=200 units per day

A= Rs 100

h= Rs 2 per unit per unit per day

$\boldsymbol{\pi}$= Rs 10 per unit

i) Find the optimal policy

Optimal order quantity $Q^0 = \sqrt{\frac{2AR}{h}\left(\frac{h+\pi}{\pi}\right)}$

$= \sqrt{\frac{2\times 100\times 200}{2}\left(\frac{2+10}{10}\right)}$

=154.9 units

Optimum time cycle $T^0 = \sqrt{\frac{2A}{Rh}\left(\frac{h+\pi}{\pi}\right)}$

$= \sqrt{\frac{2\times 100}{200\times 2}\left(\frac{2+10}{10}\right)}$

$= \sqrt{\left(\frac{3}{5}\right)}$

$=\sqrt{0.6}$

=0.7 days

=16 hours.

From this it has been known that the supply of 154.9 units has been to be made every 16 hours.

ii) To find the best policy if penalty costs becomes ∞.

Here the πpenalty cost or shortage cost means ∞

$Q^0 = \sqrt{\frac{2AR}{h}\left(\frac{h+\pi}{\pi}\right)}$

$= \sqrt{\frac{2\times 100\times 200}{2}\left(\frac{2+\frac{1}{0}}{\frac{1}{0}}\right)}$

$= \sqrt{20000}$

=141 units.

Likewise have to find the optimum time cycle.

Optimum time cycle $T^0 = \sqrt{\frac{2A}{Rh}\left(\frac{h+\pi}{\pi}\right)}$

$= \sqrt{\frac{2\times100}{200\times2}\left(\frac{2+\frac{1}{0}}{\frac{1}{0}}\right)}$

$=\sqrt{0.5}$

$=0.7$ days

T^0=16 hours

If the penalty cost becomes ∞ the supply of 141 units has to be made for every 16 hours.

Problem 3:

This was based on inventory with **NO** shortage. A garment follows the economic order quantity system for maintaining stocks of one of its component requirements. The annual demand is for 23000 units, the cost of placing an order is Rs200, and the component cost is 50 per unit. The factory has imputed 24 percent as the inventory carrying cost.

i) Find the optimal interval for policy orders, assuming 1 year = 360 days.

ii) If it is decided to place only one order per month, how much extra cost does the factory incur per year as the consequence of this decision?

Solution:

Formula:

Optimum order quantity $Q^0 = \sqrt{\frac{2AR}{h}}$

Optimum cycle time $T^0 = \sqrt{\frac{2A}{hR}} = \frac{Q^0}{R}$

Minimum total cost $=\sqrt{2AhR}$

Where,

R= Annual demand

A = Cost of placing order

h = Carrying and holding cost

Given:

R= 23000 units

A = Rs 200

Cost of each components =Rs 50 per unit

h = 24% of inventory value

$= \frac{24}{100} \times 50$

=Rs 12

i) Find the optimum time interval

Optimum time interval $T^0 = \sqrt{\frac{2A}{hR}}$

$= \sqrt{\frac{2\times200}{23000\times12}}$

$= \sqrt{\frac{400}{276000}}$

=0.03806yrs

$=0.03806\times 360$

=14 days

Therefore, 14 days was the optimum interval time

ii) Only one order per month

Annually total number of order =12

Total ordering cost per year $=12\times 200$

=Rs 2400

For holding cost per annum,

Q, Quantity order each time $=\frac{23000}{12}$

= 1917 units

It means 1917units will be ordered once.

Average inventory at any time $=\frac{Q}{2}$

$=\frac{1917}{2}$

Average inventory at any time is**958** units

Total holding cost $=12\times 958$

= 11496Rs

Total cost = (2400+ 11496)
=13896Rs
By taking the decision of placing one order per month the total cost is 13896Rs
Now we have to find the actual total cost to pay if the company doesn't follow the above policy.
Actual total cost $TC_{actual}=\sqrt{2AhR}$
$=\sqrt{2 \times 200 \times 12 \times 23000}$
=Rs 10507
Extra cost =Rs 13896-Rs 10507
=Rs 3389.
Therefore the company have to pay extra cost of Rs 3389 if it chooses the decision of ordering every month.

Problem 4:
Calculate the economic order quantity with the given data. The following data are
Annual consumption =5000 units
Cost of ordering = Rs 50
Carrying costs = Rs 2

Solution:
Formula:

$$EOQ=\sqrt{\frac{2\times A\times O}{C}}$$

Given:
A= 5000 units
O = Rs 50
C = Rs 2

$$EOQ=\sqrt{\frac{2\times A\times O}{C}}$$
$$=\sqrt{\frac{2\times 5000\times 50}{2}}$$
= 500 units.

Number of orders to placed ==$\frac{\textit{Total consumption of materials per annum}}{\textit{Economic order quantity}}$

$=\frac{5000}{500}$

=50 order per year.
Therefore, 50orders can be placed in a year.

Problem 5:
This was based on inventory with NO shortage. The garments uses the commodity at an approximately constant rate of 4000 per year. The commodity costs Rs 20 per kg and the company estimate that it costs Rs 150 to place an order, and the carrying cost of inventory is 10% per year.
i)How frequently should orders for commodity be placed ,and what quantities should ordered for?
ii)If the actual costs are 400rs to place an order and 15% for carrying costs ,the optimum policy would change how much is the company losing per year because of imperfect cost information.

Solution:

Optimum order quantity $Q^0=\sqrt{\frac{2AR}{h}}$

Optimum cycle time $T^0=\sqrt{\frac{2A}{hR}}=\frac{Q^0}{R}$

Minimum total cost $=\sqrt{2AhR}$
Where,
R= Annual demand
A = Cost of placing order
h = Carrying and holding cost

Given:
Constant demand R =4000kg per year
Costs of commodity = Rs 20per kg
Ordering costs A = Rs 150
Carrying/holding cost h= 10% of stock per year
$=\frac{10}{100}\times 2$
=Rs 2

i) Optimal order quantity $Q^0=\sqrt{\frac{2AR}{h}}$

$$=\sqrt{\frac{2\times 150\times 4000}{2}}$$

$=\sqrt{600000}$
=775kg.
Now we calculate optimum time interval after which each order will be placed.

Optimum cycle time $T^0 = \frac{Q^0}{R}$

$= \frac{775}{4000}$

=1year

= 12months

To find optimum no.of.orders to be placed

$n_0 = \frac{R}{Q^0}$

$= \frac{4000}{775}$

=5 orders.

It means we need to place 5 orders each after the time interval of 73 days. And optimal order quantity for each order will be 1000kg.

ii) A = 400Rs
h= 15% of Rs 20
=Rs 3

Now we have to find the total cost that company have to pay.

$TC_{P2} = \sqrt{2AhR}$

$=\sqrt{2 \times 400 \times 3 \times 4000}$

=3098.3Rs

=3098Rs

$TC_{P1} = \sqrt{2AhR}$

$=\sqrt{2 \times 150 \times 2 \times 4000}$

= 1549Rs

We can calculate the loss by subtracting,

Loss incurred $= TC_{P2} - TC_{P1}$

=3098 Rs-1549Rs

= 1549Rs.

CONCLUSION:

And finally from this inventory with shortage and inventory with non shortage problems , the company can hold about the details like –how much items can be sold or how many items should be ordered.

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