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NEED/IMPORTANCE OF THE STUDY

STATEMENT OF THE PROBLEM

OBJECTIVES

HYPOTHESES

RESEARCH METHODOLOGY

RESULTS & DISCUSSION

FINDINGS

RECOMMENDATIONS/SUGGESTIONS

CONCLUSIONS

SCOPE FOR FURTHER RESEARCH

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APPENDIX/ANNEXURE

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- Hunker, H.L. and A.J. Wright (1963), "Factors of Industrial Location in Ohio" Ohio State University, Nigeria.

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STATIONARY DEMAND CURVE MODEL UNDER JUST IN TIME INVENTORY SYSTEM

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ABTRACT

We are familiar with the usual concept of inventory management where the chief attention is to determine Economic Order Quantity keeping cost of holding, setup cost and shortage cost in view. In order to meet economy one has to maintain some inventory of material. According to Johnson and Montogomer (1) inventory can be considered as an accumulation of commodities, which can be used to satisfy some future demands. The main reason for maintaining inventory level is to shorten the gap between demand and supply. Scientific control of inventory is essential for smooth and efficient running of business, adequate and prompt service to customers, improved profits etc. The classical EOQ model developed by Harris and Wilson (2) consists of the following three costs (i) Holding or Inventory carrying cost (ii) Shortage cost or cost of unsatisfied demand (iii) Replenishment cost or ordering cost or setup cost. In any inventory system one has to answer at least one of the following questions: I. How much to order II. When to order, so that total cost of inventory system remains minimum. But due to several uncontrolled factors like changing pattern of customers' taste and habits etc. the left over inventory of material may get deteriorated as well as may not meet with the level of satisfaction of customer Kotler (3). Hence it is not beneficial to hold more stock because it unnecessarily increases holding cost and hence the total cost. On the other hand keeping scarce inventories may sometimes results in a shortage, which increases shortage, cost and hence the total cost. Thus these three costs are so much interrelated that reduction in any one of them results in significant increase in one or both other costs and hence the total cost. The basic model proposed by Grout and Seastrand (12) is extensively used in studying manufacturing aspect of JIT from various dimensions and angles. In this paper we have developed JIT manufacturing model with dynamic demand and varying setup cost under three fundamental restriction i.e budget, space and inventories. Model developed is supported by suitable hypothetical problem with justifies the model's purpose.

KEYWORDS
Stationary demand curve moder, JIT.

INTRODUCTION

In this paper, the inventory problems are considered under the pricing structure. The model developed here strongly supports the fact that consistent relationship between the vendor and the buyer can help both of them to optimize their profits.

The model here is developed here is based on the assumption that buyer knows his requirements and the producer is always aware of it. So ultimately producer can decide his products selling price such the both the parties that is the buyer and the supplier can get optimum returns.

Generally the producer or seller buys material for a known cost and stores it per year. Let us assume that the producer knows the number of units demanded at any given price, costs k with each unit demanded, and his fixed costs per year is Rs. f. The problem is to determine the selling price in order to optimize profits.

Assume that quantity demanded (D) is a linear function of price (p) of final product and is given as $D = a_1+a_2p$

NOTATIONS

Q: Contract Quantity (units).
D: Annual demand (units).
A: Cost of placing an order (Rs. / order).
N: Number of shipments per contract.
P: Aggregate cost per shipment.
H: Cost of holding an inventory (Rs./unit/order).
b: positive constant.

ASSUMPTIONS

1. Demand is linear function of price.
2. Lead-time is negligible.
3. Shortages are not allowed.

PROBLEM FORMULATION

The total variable cost is given by

$$TVC(Q) = (A + NP + bQ)\frac{D}{Q} + \frac{QH}{2N} + kD \qquad (1.1)$$

Considering $D = a_1 + a_2 p$ in above equation.

$$TVC(Q) = (A + NP + bQ)\frac{(a_1 + a_2 p)}{Q} + \frac{QH}{2N} + k(a_1 + a_2 p) \qquad (1.2)$$

$$TVC(Q) = (A + NP)\frac{(a_1 + a_2 p)}{Q} + \frac{QH}{2N} + (k + b)(a_1 + a_2 p) \qquad (1.3)$$

Differentiating equation (1.3) w.r.t. Q and equating to zero, we get

$$-(A+NP)\frac{(a_1+a_2p)}{Q^2}+\frac{H}{2N}=0 \quad (1.4)$$

$$(A+NP)\frac{(a_1+a_2p)}{Q^2}=\frac{H}{2N} \quad (1.5)$$

Therefore,

$$Q^*=\sqrt{\frac{2N(A+NP)(a_1+a_2p)}{H}} \quad (1.6)$$

Thus, the minimum variable cost is

$$TVC(Q^*)=\sqrt{\frac{2H(A+NP)(a_1+a_2p)}{N}}+(k+b)D \quad (1.7)$$

The annual profit may be given as

$$P^*=Dp-\sqrt{\frac{2H(A+NP)(a_1+a_2p)}{N}}-(k+b)D-f \quad (1.8)$$

Substituting $D = a_1+a_2p$ in equation (1.8), we get

$$P^*=(a_1+a_2p)p-\sqrt{\frac{2H(A+NP)(a_1+a_2p)}{N}}-(k+b)(a_1+a_2p)-f \quad (1.9)$$

The optimum price for which the profit is maximized is given by differentiating (1.9) w.r.t. p and equating to zero. Thus $\frac{dP^*}{dp}=0$ implies

$$(a_1+2a_2p)-a_2\sqrt{\frac{H(A+NP)}{2N(a_1+a_2p)}}-a_2(k+b)=0 \quad (1.10)$$

This equation cannot be solved analytically and hence the value is obtained through successive approximation. Where

$$P^*=\frac{\left[a_2\left(\sqrt{\frac{2H(A+NP)}{2N(a_1+a_2p)}}+(k+b)\right)-a_1\right]}{2a_2} \quad (1.11)$$

Using P* obtained from (1.11) in (1.6) we get optimum order quantity which allows supplier to optimize profit and the buyer to minimize, total inventory cost.

Hypothetical Problem:

Let A = Rs. 20 per order; N = 4, P = Rs.15 per shipment, D = 15000 units, H = Rs. 0.5, k = Rs. 4 per unit, $a_1 = 10$, $a_2 = 100$.

For p = 10

$$P^*=\frac{\left[a_2\left(\sqrt{\frac{2H(A+NP)}{2N(a_1+a_2p)}}+(k+b)\right)-a_1\right]}{2a_2}$$

Optimum value of selling price P* is Rs.2

Therefore, $Q^*=\sqrt{\frac{2N(A+NP)(a_1+a_2p)}{H}}\approx$ 519 units

REMARK

The hypothetical problem shows that if supplier charges Rs. 2 per unit he can earn maximum profit. The supplier as makes frequent deliveries of small shipments, which reduces his inventory level and leads buyer to minimize the total inventory cost where each contract quantity is of 519 units approximately. Thus both buyer and supplier are mutually benefited.

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