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Production Inventory Model with Inventory Level Constraint and Disposed Cost

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ABSTRACT

This paper creates production inventory model with inventory level constraint, disposed cost and transportation cost. The merchant manufacturing the products and give discount for bigger request amount to the purchaser. The purchaser himself arranged the damaged products and having transportation cost. Besides, system cost is developed and it satisfies inventory level constraint. Finally, numerical examples illustrate the developed model.

Keywords: Production, Inventory, Order Quantity, Disposed cost.

1. INTRODUCTION

Inventory is the phrasing by and large use for accessible products available to be purchased and for unrefined components used to make merchandise available to be purchased. Stock is a load of things kept to meet future demand. Different inquiries come as a top priority when top administration needs to choose the number of units to arrange when to arrange. This question comes at the top of the priority list since it is critical to appropriately oversee stock. In the event that the organization can't deal with the stock appropriately. Organization might need to experience gigantic misfortunes in the association. So we must have to keep stock and to diminish bullwhip impact so that request data don't misshape as it gets away from end-use client.

Muniappan et al. [4] empowered a melded cash related sales total model including stock level and thing house limit. Ravithammal et al. [5] empowered an ideal regarding stock model for isolating things with positive shocking restriction of huge worth discount speed of interest. Mishra et al. [3] focused on a viable creation stock model for a controllable non-renewable energy source results rate under lacks. Saha et al. [7] made a restricted time coordination part with demand subject to cost and arrangements attempts. Sarkar et al. [8] empowered an accommodating advancing composed exertion technique underway organization the leaders under uncertain circumstances. [1] Jawla and Singh [1] considered a multi-thing financial creation amount model for defective things with different creation arrangements and revise under the impact of protection innovation and learning climate. Kang et al. [2] created ideal requesting strategy for a blemished single-stage fabricating framework with security stock and arranged delay purchase. Rabbani and Aliabadi [6] examined a stock model with credit, cost and showcasing subordinate interest under allowed deferred installments and deficiencies. Teng et al. [9] considered stock part size arrangements for crumbling things with termination dates and settlements ahead of time. Tiwari et al. [10] considered effect of exchange credit and augmentation on retailer's referencing approaches for non-fast deteriorating things in a two-apportionment center climate.

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2. ASSUMPTIONS AND NOTATIONS

The model use the following assumptions and notations

Assumptions

(i) The model perceives consistent interest.

(ii) The buyer order the larger quantity than regular quantity and himself make the arrangement for damaged products.

(iii) Merchant manufacturing the products and provides discount to the purchaser for bulk purchase.

Notations

P Production cost for vendor

D Demand rate

p Purchase cost

k_1 Buyer's ordering cost

k_2 Vendor's setup cost

h_1 Buyer's holding cost

h_2 Vendor's holding cost

Q Economic Order quantity

F Buyer's fixed transportation cost

U Buyer's unit variable cost for order handling and receiving

m Vendor's multiples of order

x Percentage of defecting items

y Percentage of scrap items

C_d Disposed cost

α Lagrange multiplier function

N Maximum Inventory

d(k) Discount factor

TC_{s1} Integrated system cost

3. FORMULATION OF THE MODEL

For the current situation the merchant give a discount to the purchaser at a discount factor d(k) when the purchaser changes his request. Thus, all out cost for purchaser and merchant can be composed as

$$TC_b = \frac{k_1 D}{KQ} + \frac{h_1 KQ}{2} + \frac{xyC_d KQ}{2} + F + UKQ \quad (1)$$

$$TC_v = \frac{k_2 D}{mKQ} + \frac{h_2 mKQ}{2}\left(\frac{P-D}{P}\right) + pDd(k) \quad (2)$$

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$\mathrm{TC_{s1}} = \mathrm{TC_b} + \mathrm{TC_v}$

Subject to the constraints, $\frac{Q}{2} \leq N$

$$TC_{s1} = TC_b + TC_v + \alpha\left(\frac{Q}{2} - N\right)$$

$$\mathrm{TC_{s1}} = \frac{\mathrm{k_1 D}}{\mathrm{KQ}} + \frac{\mathrm{h_1 KQ}}{2} + \frac{xyC_d KQ}{2} + \mathrm{F} + \mathrm{UKQ} + \frac{\mathrm{k_2 D}}{\mathrm{mKQ}} + \frac{\mathrm{h_2 mKQ}}{2}\left(\frac{\mathrm{P-D}}{\mathrm{P}}\right) + \mathrm{pDd(k)} + \alpha\left(\frac{Q}{2} - N\right) \quad (3)$$

Now equation (3) will be composed as

$$\mathrm{TC_{s1}} = \left\{\frac{\mathrm{Kh_1 + mKh_2}\left(\frac{\mathrm{P-D}}{\mathrm{P}}\right) + 2\mathrm{KU} + xyKC_d + \alpha}{2}\right\}\mathrm{Q} + \left\{\frac{\mathrm{k_1 D}}{\mathrm{K}} + \frac{\mathrm{k_2 D}}{\mathrm{mK}}\right\}\frac{1}{\mathrm{Q}} + \mathrm{F} + \mathrm{pDd(k)} - \alpha N \quad (4)$$

It is in the type of $x_1 Q + \frac{x_2}{Q} + x_3$.

Q will be taken as, $Q = \sqrt{\frac{x_2}{x_1}}$

$$\mathrm{Q^*} = \sqrt{\frac{2\left(\frac{\mathrm{k_1 D}}{\mathrm{K}} + \frac{\mathrm{k_2 D}}{\mathrm{mK}}\right)}{\mathrm{Kh_1 + mKh_2}\left(\frac{\mathrm{P-D}}{\mathrm{P}}\right) + 2\mathrm{KU} + xyKC_d + \alpha}} \quad (5)$$

Where $\alpha = \frac{\frac{\mathrm{k_1 D}}{\mathrm{K}} + \frac{\mathrm{k_2 D}}{\mathrm{mK}} - 2\mathrm{N^2}\left(\mathrm{Kh_1 + mKh_2}\left(\frac{\mathrm{P-D}}{\mathrm{P}}\right) + 2\mathrm{KU} + xyKC_d\right)}{2\mathrm{N^2}}$

4. NUMERICAL EXAMPLE

Example1. Let k_1=200; k_2=400; D=1000; P=3000; h_1=0.3; h_2=0.4; K=2; m=3; p=2; U=0.2; x=0.3; y=0.2; cd=0.4; F=0.2; N=150; dk=15%.

The optimal solution is

$Q = 300, \alpha = 0.6557,\ \mathrm{TC_b} = 550.7333, \mathrm{TC_V} = 762.2222, \mathrm{TC_{S1}} = 1.3130\ X\ 10^3$

5. CONCLUSION

In this paper, production inventory model with inventory level constraint, disposed cost and transportation cost is analyzed. In this model merchant delivered the item and provides discount to the purchaser. The purchaser himself makes the plan for damaged item and having transport cost moreover. System cost is made for system optimization and it fulfills the inventory level constraint. It is then depicted with the help of numerical models. The objectives of this paper can in like manner be connected with various settings including multi-things, price dependent demand, shortages etc.,

REFERENCES

[1] P. Jawla, &S. R. Singh, Multi-item economic production quantity model for imperfect items with multiple production setups and rework under the effect of preservation technology and learning environment. International Journal of Industrial Engineering Computations, **7** (2016), 703–716.

[2] C. W. Kang, M. Ullah, & B. Sarkar, Optimum ordering policy for an imperfect single-stage manufacturing system with safety stock and planned backorder, The International Journal of Advanced Manufacturing Technology, **95** (2018), 109–120.

[3] U. Mishra, J.Z. Wu, B. Sarkar, A sustainable production-inventory model for a controllable carbon emissions rate under shortages, J. Cleaner Prod. **256**(2020), 120268.

[4] P. Muniappan, M. Ravithammal, M. Haj Meeral, An Integrated Economic Order Quantity Model Involving Inventory Level and Ware House Capacity Constraint, International Journal of Pharmaceutical Research, (3) **12** (2020), 791-793.

[5] M. Ravithammal, P. Muniappan and R. Uthayakumar, An Optimal Pricing Inventory Model for Deteriorating Items with Positive Exponential Function of Price Discount Rate of demand, Jour of Adv Research in Dynamical & Control Systems, (5) **10** (2018), 639-645.

[6] M. Rabbani, & L. Aliabadi, An inventory model with credit, price and marketing dependent demand under permitted delayed payments and shortages: A signomial geometric programming approach, Uncertain Supply Chain Management, (1) **7** (2019), 33–48.

[7] S. Saha, N. M. Modak, S. Panda, S. S. Sana, Promotional coordination mechanisms with demand dependent on price and sales efforts, J. Ind. Prod. Eng., **36(**2019), 13–31.

[8] B. Sarkar, M. Omair, N. Kim, A cooperative advertising collaboration policy in supply chain management under uncertain conditions, Appl. Soft Comput., **88**(2020), 105948.

[9] J. T. Teng, L. E. Cárdenas-Barrón, H. J. Chang, J. Wu, & Y. Hu, Inventory lot-size policies for deteriorating items with expiration dates and advance payments, Applied Mathematical Modelling, (19) **40** (2016), 8605–8616.

[10] S. Tiwari, L.E. Cardenas-Barron, A. Khanna, & C. K. Jaggi, Impact of trade credit and inflation on retailer's ordering policies for non-instantaneous deteriorating items in a two-warehouse environment, International Journal of Production Economics, **176** (2016), 154-169.