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Inventory Control Policy with Two – Warehouse: Latest Trend

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Abstract—*Inventory is the stock of goods and items keep under in any business for the region of sales and future production. Inventory may be stay in the form of raw materials, work -in -process and finished goods. An inventory management sports a lot to achieve maximum efficiency in theinventory. It helps in preserving inventory in appropriate quantity and supplying the same at the right timing. Warehousing is necessary through which manager gather the goods and hence makes the profit for the organization. In this paper latest work in the field of inventory control for warehousing are presented.*

Keywords: *Inventory, Two warehouse, Various demand.*

1. Introduction

The main origin of Operations research was during the second world. Operations research is a quantative decision making techniques. It helps to make better decisions. Their aim is to analyse the situation critically and prepared decision for a final result which is in the best organization of a whole. At present, Operations research covers a wide range of topics such as waiting line, inventory problems and allocation problem etc. Inventory models are an important branch of Operations research. The main objective of a model is to analysethe behaviour of the system for the purpose of improving its performance. Models play an important role in operations research. A model is the representation of doing work. Models can be classified by their behaviour, structure, purpose, method of solution etc. Some of important operations research models are given as distribution models, network models, inventory control models, waiting line etc. Scientific models are used in operations research to solve problem for optimum solutions. Since the operations research helps to analyse and minimize the total inventory cost in situation where inventory affects demand. This inventory models helps to maximize the profit. The procedure for an operations research study generally involves the following major phases:

a. Define the problem.

b. To establish a model in mathematical form.

c. Obtain the solution from the model.

d. To check the reliability of the model and its solution.

e. Supervise the solution.

f. Applying the solution.

2. Inventory

Inventory is basically defined as sum of raw material, finished and semi-finished goods which are available all around us. The main purpose of the inventory is to minimize the cost and maximize the profits. Inventory is the essential part of every trade such as farms, manufacturers, wholesalers, retailers etc. Good inventory modelling is an important for all firms, whether manufacturing or service. Customer satisfaction is the main motive for retailer to store the inventory. A suitable grouping of the category of inventory is the following:

a. Raw materials.

b. Work- in -progress inventory.

c. Ready to sell goods

Organizations with stock items of small unit price generally update their complete list of items at the end of considering time. The worth of an inventory to be controlled by evaluation method used, such as FIFO method or LIFO method. The necessity of having inventory has been balanced against sufficient cost of ordering, carrying and storing inventories. It assumed capital cost, service cost and storage cost. So, it becomes necessary to maintain inventory because of the following causes:

- Inventory wants to decrease setup cost and shortages costs.
- It supports in easy running of any business.
- It delivers faster facility to the customers.
- To avail quantity discounts on bulk purchases.

Inventory control is the co-operation and observation of supply, storage allocation and recording of material to obtain quantity is enough for current demand in the absence of loss and uncontrolled supply. It helps to provide a continuous

supply of product to the customer. It also determined that time and quantity of various items to be procured. The inventory control issue consists of determination of these reasons:

- When to order?
- In which quantity the items to order?

The objectives of inventory control to keep inactive, waste ,surplus items at the minimum level, to protect against inflation, to minimize holding, replacement and shortage cost of inventories, to supply the products, raw materials, work-in-progress ,process goods to its users as per their requirement at the correct time at the reasonable price. The principle of stock problem is to minimize total cost or to maximize profit.

3. Warehousing

Warehouse is a trade building for storage of uncooked, fresh vegetables, foodstuffs etc. that secured in majority and decays always with time, a shopkepper first separated the decay items from the clean items otherwise the good component will be affected by decayed items. Suppliers buy goods in large amount because no firm can reinforce a condition of shortages. So, we have to buy products in greater quantity to satisfy order of markets. So, supplier gives a offer on majority items on certain quantities in a fixed minimal time. We first keep the goods in an OW of limited size and then we keep only extreme goods in RW. The holding cost of RW is greater than that of an OW. Warehousing is essential due to the following cause:

- Seasonal demand.
- Seasonal production.
- Continuous production.
- Large scale production.

4. Inventory Models for Two Warehouse Policy: Latest Trend

Hartley (1976) addressed the first two warehouse inventory model under the assumption that RW causes a higher inventory holding cost then OW. Thus, goods in RW are the first transfer to OW to meet the need until the stock size in RW let fall to zero and then item in OW are delivered.

Sharma (1983) developed a deterministic inventory model with two levels of storage under infinite replenishment rate. Inventory theorist have studied the model with two-warehouse concept in mind and came out with certain exciting facts.

Singh *et al.*(2011) developed a deterministic two-warehouse inventory model for decline items where demand is subject to the present stock level under the condition of permissible delay. Because of various storage conditions, worsen rate into different stores may be differ. Shortage are neither totally backlogged nor totally lost.

A model for time dependent and variable dependent demand was established by **Bhunia and Shaikh (2011)** . The rate of the object is based on continuous time, selling rate of the good and the number of advertisements. The replineshment rate is infinite. Shortages are permitted and partly backlogged with their subject to the duration of waiting time up to the arrival of next order. The demand of items increases with the increase of frequency of advertisement is directly proportional to the number of advertisements. Therefore, from the economical point of theory, sometimes two storage system is more profitable then the single storage system**.**

Yadav *et al.* (2012) applied an algorithm with fuzzy to an inventory model of decaying products with two-warehouse considering stock dependent demand. Joint replenishment and side by side transfer of products from one store to another is established by basic period policy. Since holding cost is fuzzy in essence, the average gain is also fuzzy in essence.

An inventory model for time varying deterioration with increasing demand rate were established by **Goswami *et al.* (2012).** This model is optained with limited charge and unequal range of the cycle time. The holding cost of the structure is reduced. To solve a model with the theory of quadratic rate which is helpful for products whose rate increases very quickly.

Singh and Dem (2012) studied a two-warehouse manufacturing model for decaying items with the pattern of dependent demand which is based on time. Using LIFO dispatching policy for model formulation, our aim is to obtain the maximum gain and the corresponding best recommendation. A profit optimization function with appropriate constraints and an algorithm for its solution are developed to determine the production rate and the replenishment times for the proposed model.

Yang and Chang (2013) formulated a partial backlogging inventory model for declining products. The supplier prefers a permissible delay in payment to attract more sales. The aim of the study is to take the retailers perfect replacement policy that maximize the available value of the gain per unit time.

Kumar *et al.* (2013) offered a model for deteriorating products under the impact of inflation where demand follows a combination of linear time variable and on hand inventory level. Shortages are permitted. In OW, deterioration rate is linear depending on time and in RW Weibull distributed deterioration was studied. It is found out that the available gain as well as the net profit per unit time was observed to reduce for boosting number of cycles. The gain for every limit time was observed to be enlarge for first cycle.

Kumari *et al.*(2014)formulated a model for deteriorating items under the result of inflation with shortages. Because of different spaces, inventory holding cost is offered to be different in separate warehouses. The rate is according to goods level with inflation.

Jaggi *et al.* (2014) investigated an inventory model for single deteriorating item with separate keeping space having

different preserving facilities. To analyse the impact of changes of set-up cost, demand and own warehouse size on the best policies of the work.

Kumar *et al.* (2015) proposed a two-warehouse system for decaying items with ramp type demand. At the beginning, demand is considered to be a linear function of time and it becomes fixed after a horizon time. Where carrying cost assumed to be fixed in both warehouse and relatively backlogging is permitted. This is developed to decrease total cost that include carrying cost, backlogging cost, departed sale cost and deteriorating rate.

Khurana (2015) proposed a two-warehouse inventory mode under inflation for decaying objects. The demand is based ontime. Carrying and deterioration costs are inconsistent in warehouses because of various preservation technology. This is explained for different system variables and best result at the end. The result finds that the available gain per unit time is established to expand for first cycle.

Dutta (2015) suggested a fuzzy model keeping in mind cubic demand based on time, holding price, ordering cost and back ordering rate to be fuzzy in essence. Shortages are permitted in the owned warehouse. The best outline for cost variables is Triangular fuzzy number. Final output of the structure is procured with method signed distance difuzzification.

Singh and Rathore (2016) presented a two- warehouse model with non- instantaneous decline rate with the influence of inflation for decay goods. This model is used for fruits, vegetables and cosmetic products etc. Rate is treated as linear function of instantaneous stock level. Shortages are permitted and partly backlogged. The main motive of the paper is to observe the best value of the total cost function.

An inventory model with K- release rule for two-warehouse was developed by **Kumar and Kumar (2016).** The theory of K-release rule is more realistic as carrying large amount of stock in rented warehouse is very costly. This model gives the opinion to decision makers to conclude the fuzzy fact while calculate earn more profit for the organization.

Gothi *etal.* (2016) developed a two-warehouse inventory model for deteriorating items with constant deterioration rate where demand is quadratic with time changing carrying cost. The result of permissible delay in payments is also assumed. The aim is to reduce the average total cost per unit per item under the impact of inflation. If the value of parameter increases, the average total cost also increases.

Yadav *et al.* (2016) formulated an inventory model for Weibull distribution deterioration rate where demand is ramp type. The goal is to drive the optimal replenishment result in view of different rate that minimizes the current cost of total suitable carrying cost per item of time. This model is helpful for immediate degenerate items, Weibull distribution deterioration rate as stock cost is subject to rate indirectly proportional to demand.

Jaggi *et al.* (2017) studied a problem related to inventory for non -instantaneous decay products with fixed demand rate under separate dispatching policies i.e. LIFO,FIFO. Shortages are permitted and partial backlogged. The present study provides the best result as well as perfect dispatch policy.

Rastogi *et al.*(2017) proposed an inventory model for deteriorating items with the market rate according to the need of customers. The shortages are considered to be limited. The aim of the study is to determine rate and time of system which can find the total standard cost of the system**.** It is concluded that demand can increase capacity of OW decreases total system. In order to reduce the inventory cost, it will be more realistic and profitable for organization to store items in OW before RW, but utilized the goods in RW before OW.

A two-warehouse inventory model for deteriorating objects under the conditions of permissible delay in payments is presented by **Jaggi *et al.* (2017)** with imperfect quality.The screening amount is considered to be more than the demand rate so that the demand can be fulfilled out of the items that are formed to be of good quality while the screening is in progress. As the defective items increase, total profit decreases in such situation the corrective measures need to be taken in order to procure good quality products.

Reddy and Venkateswarlu (2018) studied the optimum inventory policies for a two -warehouse model under time based quadratic demand rate. The total cost of inventory system increase (decrease) with the extension in initial demand, setup cost and inventory carrying cost of own-warehouse. The change in total cost of the system are insignificant with respect to the change in the holding cost of rented house, selling prices and the capacity of owned warehouse.

Patel (2018) presenteda two-warehouse inventory model for deteriorating items with different deterioration rate on the time and pricebased demand. Carrying cost is considered as linear function of time. Inflation factor is also considered with permissible delay. Shortages are also allowed. With the extend / decrease in the variable values, there is corresponding boost / decline in the value of profit.

Rathoreand Singh (2018) proposed atwo-warehouse model with preservation technology investment and advertisement based on rate over a defined time. The primetime period, the number of advertisements, cost associated with preservation technologies and total cost function are well surveyed to present good inventory control structure. This review is an ideal result for the organization dealing with fashionable products, mobile phone s etc.

A two -warehouse model with exponential rate and partial lost sales is again developed by **Singh and Agarwal (2018)** for lifetime deterioration and inflation with Weibull distribution with the time dependent demand rate and inflation is exponentially decreasing function to time. In our model, stored products value will decay after a period of time not

immediately. This model is very useful in cloth business,real state, marts or any large scale and business of electronics.

A fuzzy two-warehouse model for single deteriorating product is proposed by **Indrajitsingha *et al.* (2019)** with selling-price- dependent demand. Shortages are permitted and partially backlogged with a rate based on the period of waiting time up to the arrival of next cycle. It is observed that an uncertainty nature of the system parameters, the total average cost decreases in fuzzy model as compared to crisp model. Centroid method gives more accurate result as compared to signed distance method.

A credit policy approach in a two- warehouse inventory model for deteriorating items is developed by **Panda *et al.* (2019)**. Demand is dependent on frequency of advertisement, price and goods are under partly backlogged shortage. Number of advertisements as fixed in a year. This work is really non-linear in nature.

Bishi *et al.* (2019) proposed a two-warehouse inventory model for non -instantaneous deteriorating items with exponential demand rate under time varying holding cost and different dispatching policies. Shortages are allowed and completely backlogged. The discount rate, low-cost storage, very large demand under such a condition one may conclude to obtain huge items which emerge the problem of storing.

5. Conclusion

Researcher observed that inventory is affected by the two-warehouse and its policy. Many researchers suggest that the quantity of goods exceed the keeping space of owned godownwhich is extended to certain level, then firm engages a rented warehouse at a high carrying cost. Also, it is noted that the change in total cost of the system are affected with respect to the change in holding cost of rented warehouse and capacity of owned warehouse.

References

[1] Hartley V. R., "Operation research -a managerial emphasis California", *Good year publishing company*,1976, pp. 315-317.

[2] Sarma K. V. S., "A deterministic inventory model with two levels storage and optimum release rule",*Opsearch* ,20, 1983, pp.175-180.

[3] Singh S. R., Kumari R. and Kumar N., "A deterministic two warehouse inventory model for deteriorating items with stock dependent demand and shortages under the condition of permissible delay", *International journal of mathematical modelling and numerical optimisation*, 2(4), 2011, pp. 357-375.

[4] Bhunia A. K. and Shaikh A. A., "A two-warehouse inventory model for deteriorating items with time dependent partial backlogging and variable demand dependent on marketing strategy and time", *International journal of inventory control and Management*, 1(2), 1, December,2011, pp.95-110.

[5] Yadav D.,Singh S. R. and Kumari R., "Inventory model of deteriorating items with two warehouse and stock dependent demand using genetic algorithm in fuzzy environment", *Yugoslav journal of operations research,* 21(2), February 2012, pp.1-29.

[6] Sett B. K., Sarkar B. and Goswami A., "A two-warehouseinventory model with increasing demand and time varying deterioration",*Scientia Iranica,* 19(6),7, August,2012, pp.1969-1977.

[7] Dem H. and Singh S. R., "A two-warehouse production model with quality consideration",*Procedia Engineering* ,38,December,2012, pp. 3242-3259.

[8] Yang H. L. and Chang C. T., " A two-warehouse partial backlogging inventory model for deteriorating items with permissible delay in payment under inflation",*Applied mathematical modelling,*37, 2013, pp. 2717-2726.

[9] Kumar N., Singh S. R. and Tomar J., "Two warehouse inventory model with multivariate demand and K- release rule",International conferenceon computational intelligence:Modellingtechniques and applications,(CIMTA),2013.

[10] Bhunia A. K., Jaggi C. K., Sharma A. and Sharma R., "A two-warehouse inventory model for deteriorating items under permissible delay in payment with partial backlogging", *Applied mathematics and computation,* 232, 2014, pp. 1125-1137.

[11] Singh S. R., Rathore H. and Saxena N., " A two-warehouse inventory model for deteriorating items with shortages under inflationary environment", Proceedings of 3rd International conference on recent trends in engineering and technology (ICRTET,2014), Chandwad, 28-30 March,2014, pp. 385-391.

[12] Dutta P. and Choudhary P. D., "Fuzzy based two-warehouse inventory model for deteriorating items with cubic demand and different fuzzy cost parameters", *International journal of engineering research and general science*,3(5), September, 2015, pp. 209-218.

[13] Khurana D., "Two warehouse inventory model for deteriorating items with time dependent demand under inflation", *International journal of computer applications*,114(7), 7, March,2015, pp.34-38.

[14] Kumar V., Sharma A. and Gupta C. B. (2015), "Two-warehouse partial backlogging inventory model for deteriorating items with ramp type demand", *Innovativesystem design and engineering,* 6(2), 2015, pp.86-98.

[15] Rathore H. and Singh S. R., "A two-warehouse inventory model with preservation technology investment and partial backlogging", *Scientia Iranica* ,23(4), December, 2016, pp.1952-1058.

[16] Kumar N. and Kumar S., "Two-warehouse fuzzy inventory model with k-release rule", *Uses of sampling techniques and inventory control with capacity constraints*, Pon Editions, Brussels, Belguim, 2016, pp 53-68.

[17] Gothi U. B., Saxena P. and Parmar K., "An inventory model for two-warehouse with constant deterioration and quadratic demand rate under inflation and permissible delay in payments",*American journal of engineering research,* 5(6), 2016, pp. 62-73.

[18] Yadav A. S., Tyagi B., Sharma S. and Swami A., "Two warehouse inventory model with Ramp type demand and partial backordering for Weibull distribution deterioration", *International journal of computer application,*140(4), 4, April,2016, pp. 15-25.

[19] Jaggi C. K., Goel S. K. and Tiwari S., "Two warehouse inventory model for non-instantaneous deteriorating items under different dispatch policies" *Revista investigation operational,* 38(4),2017, pp. 343-365.

[20] Rastogi M., Singh S. R., Kushwah P. and Tayal S.,"Two-warehouse inventory policy with price dependent demand and deterioration under partial backlogging",*Decision science letters,*6, 2017,pp. 11-22.

[21] Jaggi C. K., Cardenas-Barron L. E., Tiwari S. and Shafi A. A., "A two-warehouse inventory model for deteriorating items with imperfect quality under the conditions of permissible delay in payments",*Scientia Iranica* ,24(1), 2017, pp.390-412.

[22] Reddy M. S. and Venkateswarlu R., "Optimal inventory policies for a two-warehouse inventory model under time dependent quadratic demand rate",*Global journal of pure and applied mathematics,*14(8), 2018, pp. 1011-1027.

[23] Patel R., "Different deterioration rates of two warehouse inventory model with time and price dependent demand under inflation and permissible delay in payments", *International journal of theoretical and applied sciences,*10(1), 27, January, 2018, pp. 53-65.

[24] Rathore H. and Singh A. (2018). Two warehouse model with preservation technology investment and advertisement dependent demand over a finite time horizon. *Journal of physics: conference series,* 1139,pp.1-9.

[25] Agarwal A., Rani S., Singh S. R., "Two warehouse inventory model for life time deterioration and inflation with exponential demand and partial lost sales", *International Journal of Pure and Applied Mathematics,* 118(22), May, 2018, pp. 1253-1265.

[26] Bishi B., Behera J. and Sahu S. K., "Two warehouse inventory model for non-instantaneous deteriorating items with exponential demand rate", *International journal of applied engineering research,*14(2), January,2019, pp 495-515.

[27] Indrajitsingha S. K., Samanta P. N. and Misra U. K., "A fuzzy two- warehouse inventory model for single deteriorating item with selling price dependent demand and shortage under partial backlogged condition", International journal of *Applications and applied mathematics,*14(1), June, 2019, pp. 511-536.

[28] Panda G. C., Khan M. A. A. and Shaikh A. A., "A credit policy approach in a two-warehouse inventory model for deteriorating items with price and stock dependent demand under partial backlogging", *International Journal of industrial engineering*, 15, 2019, pp. 147-170.