ABSTRACT

In this paper, the two-warehouse inventory problem is considered for deteriorating items with constant demand rate and shortages under inflationary conditions. In today’s unstable global economy, the effects of inflation and time value of money cannot be ignored; as it increases the cost of goods. To safeguard from the rising prices, during the inflation regime, the organization prefers to keep a higher inventory, thereby increasing the aggregate demand. This additional inventory needs additional storage space that is facilitated by a rented warehouse. Further ahead, in the real business world, to retain the freshness of the commodity, most of the organizations adopt the first-in-first-out (FIFO) dispatching policy. FIFO policy yields fresh and good conditioned stock thereby resulting in customer satisfaction, especially when items are deteriorating in nature. However, the two warehousing systems usually assume that the holding cost of items is more in RW than the OW due to modern preserving techniques. Therefore, to reduce the inventory costs, it is economical to consume the goods of RW at the earliest. This approach is termed as Last-In-First-Out (LIFO) approach. The objective of the present research is to develop a two warehouse inventory model with FIFO and LIFO dispatching policies under inflationary conditions. Further, comparison between FIFO and LIFO policies has been exhibited with the help of a numerical example. Sensitivity analysis has also been performed to study the impact of various parameters on the optimal solution.

Keywords: Deterioration, First-In-First-Out (FIFO), Inflation, Last-In-First-Out (LIFO), Shortages, Two-Warehouse

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1. INTRODUCTION

It is generally seen that the enterprises purchase more goods than what can be held in their OW due to many reasons like discounts on bulk purchases, inflation, re-ordering costs etc. The excess units are commonly stored in an additional storage space. This additional storage space may be a rented warehouse RW. Usually the two warehousing systems assume that the holding cost of items is more in RW than the OW due to additional and modern preserving facilities resulting in lower deterioration rate. To reduce the inventory costs, it would be economical to consume the goods of RW at the earliest. Consequently, the firm stores goods in OW before RW, but clears the stocks in RW before OW. This approach is termed as Last-In-First-Out (LIFO) approach. Another commonly adopted approach called First-In-First-Out (FIFO) is more practical. According to this approach, the deteriorating items stored in OW are used prior to the items stored in RW to preserve their freshness and reduce the deterioration rate. Thus, in keeping with this reality, organisation may prefer to use FIFO or LIFO dispatching policy depending upon the nature of items or location of the warehouses.

In the literature, a lot of work has been done on two-warehouse inventory system. An early discussion on the effect of two warehouse was considered by (Hartely, 1976) in which he assumed that the holding cost in rented warehouse (RW) is greater than that in own warehouse (OW), therefore, items in RW are first transferred to OW to meet the demand until the stock level in RW drops to zero and then items in OW are released. (Sarma, 1983) extended Hartley’s model to cover the transportation cost from RW to OW that is considered to be a fixed constant independent of the quantity being transported. But he did not consider shortages in his model. (Goswami & Chaudhuri, 1992) further developed the model with or without shortages by assuming that the demand varies over time with linearly increasing trend and that the transportation cost from RW to OW depends on the quantity being transported. In their model, the stock was transferred from RW to OW in an intermittent pattern. However, their work is for non-deteriorating items. On the other hand, deterioration has received a considerable attention in the past, and researchers have propounded a number of inventory models for the deteriorating items. The summary of all the research work done in this area till 1991 is given by (Raafat et al., 1991). Thereafter, (Wee, 1995; Abad, 1996; Chang & Dye, 1999; Goyal & Giri, 2001; Jaggi & Kausar, 2010; Valliathal & Uthayakumar, 2011) and others have done interesting work in the area of deterioration. In addition, a great deal of research efforts has been devoted to inventory models of deteriorating items in two warehousing area. (Sarma, 1983) developed a two-warehouse model for deteriorating items with the infinite replenishment rate and shortages. (Pakkala & Achary, 1992) further considered the two-warehouse model for deteriorating items with finite replenishment rate and shortages. (Bhunia & Maiti, 1998) developed a two-warehouse model for deteriorating items with linearly increasing demand and shortages during the infinite period. Recently, (Jaggi & Verma, 2010) have investigated the effect of deterioration with two storage facilities under FIFO dispatching policy and compared it with (Sarma’s, 1987) LIFO model. Research continues with (Zhou 1998; Chung & Huang, 2007; Das et al., 2007; Dye et al., 2007; Niu & Xie, 2008; Rong et al., 2008) and many more.

Further ahead, in today’s unstable global economy there is consequent decline in the real value of money, because the general level of prices of goods and services is rising (i.e., inflation). In the recent past most of countries, both developing and developed have suffered from large-scale inflation and sharp decline in the purchasing power of money. As a result, while determining the optimal inventory policy, the effect of inflation cannot be ignored. Many authors have developed different inventory models under inflationary conditions with different assumptions. In 1975, Buzacott developed an economic order quantity model under the impact of inflation. (Bierman & Thomas, 1977) proposed the EOQ model considering the
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