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A DETERMINISTIC OF SOME INVENTORY SYSTEM FOR DETERIORATING ITEMS WITH AN INVENTORY LEVEL DEPENDENT DEMAND RATE

Gajaria Bharat
Research Scholar
Sunrise University
Alwar, Rajasthan

Dr.Kapil Kumar Bansal
Supervisor
Sunrise University
Alwar, Rajasthan

ABSTRACT: The fundamental reason for carrying inventories is that it is physically impossible and economically impractical for each stock item to arrive exactly where it is needed exactly when it is needed. The goal of inventory management is to ensure the consistent delivery of the right product in the right quantity to the right place at the right time. Most of the researchers in inventory system were directed towards non-deteriorating products. However, there are certain substances, whose utility do not remain same with the passage of time. Deterioration of these items plays an important role and items cannot be stored for a long time. Deterioration of an item may be defined as decay, evaporation, obsolescence, loss of utility or marginal value of an item that results in the decreasing usefulness of an inventory from the original condition. When the items of the commodity are kept in stock as an inventory for fulfilling the future demand, there may be the deterioration of items in the inventory system, which may occur due to one or many factors i.e. storage conditions, weather conditions or due to humidity.

KEYWORDS: Inventory management, Deterioration

INTRODUCTION

Most of the inventory models were formulated in a static environment where the demand is assumed to be constant and steady. In fact, the constant demand assumption is only valid during the maturity phase of time. In realistic business situations many items of inventory such as electronic products, fashionable clothes, tasty food products and domestic goods generate increasing sales after gaining consumer's acceptance. Therefore it is more realistic if we consider demand rate as time dependent.

Many businesses are not as successful as they could be simply because they lack the know-how or the will to implement sound inventory management and control practices. Successful inventory is a compromise between low inventory levels and meeting targeted fill rates. Investing in the right inventory and reducing excess will improve customer fill rates, inventory turnover and cash flow and profits. The purpose of the study is to develop and analyze some inventory models for decaying items with variable demand rates for different realistic business situations.

REVIEW OF LITERATURE

Inventory models create a lot of interest due to their ready applicability at various places like market yards, warehouses, production process, transportation systems cargo handling, etc., several inventory models have been developed and analyzed to study various inventory systems. Much work has been reported in literature regarding Economic Production Quantity (EPQ) models during the last two decades. The EPQ models are also a particular case of inventory models. The major constituent components of the EPQ models are 1) Demand 2) production (Production) (Replenishment) and 3) Life time of the commodity. Several EPQ models have been developed and analyzed with various assumptions on demand pattern and life time of the commodity. In general, it is customary to consider that the replenishment is random in production inventory models. Several researchers have developed various inventory models with stock dependent demand. Silver and Peterson (1985) mentioned that the demand for many consumer items is directly proportional to the stock on hand. Gupta and Vrat (1986) have pointed the inventory models with stock dependent demand. Later, Baker and Urban (1988), Mandal and Phaujdhar (1989), Datta and Pal (1990), Venkat Subbaiah, et al.

(2004), Teng and Chang (2005), Arya, et al. (2009), Mahata and Goswami (2009a), Panda, et al. (2009c), Roy, et al. (2009), Uma Maheswara Rao, et al. (2010), Yang, et al. (2010), Yang, et al. (2011), Srinivasa Rao and Essay (2012), Jasvinder Kaur, et al. (2013), Santanu Kumar Ghosh, et al. (2015) and others have developed inventory models for deteriorating items with stock dependent demand. In all these models they assumed that the replenishment is instantaneous or having fixed finite rate, except Sridevi, et al. (2010) that developed and analyzed an inventory model with the assumption that the rate of production is random and follows a Weibull distribution. However, in many practical situations arising at production processes, the production (replenishment) rate is dependent on the stock on hand. But in some other situations such as textile markets, seafood's industries, etc., the demand is a function of stock on hand. Levin et al. (1972) has have observed that at times the presence of inventory has a motivational effect on demand. It is also generally known that large pails of goods displayed in the markets encourage customers to buy more. Thus, in certain items, the demand increases if large amount of stock is on hand. Another important consideration for developing the EPQ models for deteriorating items is the life time of the commodity. For items like food, processing the life time of the commodity is random and follows a generalized Pareto distribution. (Srinivasa Rao, et al. (2005), Srinivasa Rao and Begum (2007), Srinivasa Rao and Eswara Rao (2015)). Very little work has been reported in the literature regarding EPQ models for deteriorating items with random replenishment and generalized Pareto decay having stock dependent demand, even though these models are more useful for deriving the optimal production schedules of many production processes. Hence, in this paper, we develop and analyze an economic production quantity model for deteriorating items with Weibull rate of replenishment and generalized Pareto decay having demand is a function of on hand inventory. The generalized Pareto distribution is capable of characterizing the life time of the commodities which have a minimum period to start deterioration, and the rate of deterioration is inversely proportionate to time. Using the differential equations, the instantaneous state of inventory is derived. With suitable cost considerations, the total cost function is derived. By minimizing the total cost function, the optimal ordering quantity, optimal replenishment down time and optimal replenishment uptime are derived. A numerical illustration is also discussed. The sensitivity of model with respect to parameters and costs is also discussed. This model is extended to the case of without shortages.

PROPOSED WORK

The plan is to analyze the work of authors already done in the field of inventory control. By the study of the existing literature on inventory models, it is concluded that a lot of work can be done in this field by considering the more realistic situations and accordingly changing the assumptions. In the classical inventory models the demand rate is assumed to be constant the demand for physical goods may be time dependent, stock dependent and price dependent. Demand of some items increases rapidly and then it becomes almost constant or changes at a slow rate. In real life deterioration rate cannot be constant as many researchers have assumed in their models, also for most of the items the deterioration does not start in the beginning but starts after a certain period called life time, which differs item to item. It can be observed that deterioration does not depend on time only but some factors such as weather conditions, humidity, and storage conditions affect deterioration. In many real-life situations, the practical experiences reveal that some but not all customers will wait for backlogged items during a shortage period, such as for fashionable commodities or high-tech products with short product life cycle. The longer the waiting time is, the smaller the backlogging rate would be. According to such phenomenon, taking the backlogging rate into account is necessary. During shortages some customers do not wait for next replenishment and the partial backlogging rate depends on the waiting time for next replenishment.

METHODOLOGY

The following research methodology will be applied to complete the research work for this degree.

1. Collection of related literature.
2. Development of the Models.
3. Interpretation of the results with the existing models.
4. Presentation & Publication of technical research papers.

5. Improvement by the feedback of the surveys & technical research papers.

Operations scheduling and inventory management are two of the most critical activities of an organization. They directly influence how effectively the organization deploys its assets and capacity in production of goods and services. Developing feasible operating schedules and inventory control systems to meet delivery due dates and minimize waste in manufacturing or service organizations is a complex problem. This problem continues to challenge operations managers especially in today's fiercely competitive global market.

Optimizing the balance of these two opposing factors for achieving maximum profits for the firm is the focus of inventory management. The improvement in the technique used for inventory management has been gradual, created by new technology, financial need and competitive pressure. The trick to achieve the goal is to meet the objectives simultaneously and not one at a time, otherwise it just amounts to shifting the costs around the loop.

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