

A joint lot-sizing and marketing model with reworks, scraps and imperfect products**Mohsen Fathollah Bayati^a, Morteza Rasti Barzoki^b and Seyed Reza Hejazi^b**^a*School of Industrial Engineering, Iran University of Science & Technology, Tehran, Iran*^b*Department of Industrial Engineering, Isfahan University of Technology, Isfahan, Iran***ARTICLE INFO***Article history:*

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ABSTRACT

In this paper, we establish an economic production quantity (EPQ) based inventory model by considering various types of non-perfect products. We classify products in four groups of perfect, imperfect, defective but reworkable and non-reworkable defective items. The demand is a power function of price and marketing expenditure and production unit cost is considered to be a function of lot size. The objective of this paper is to determine lot size, marketing expenditure, selling price, set up cost and inventory holding cost, simultaneously. The problem is modeled as a nonlinear posynomial geometric programming and an optimal solution is derived. The implementation of the proposed method is demonstrated using a numerical example and the sensitivity analysis is also performed to study the behavior of the model.

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1. Introduction

The main focus of inventory control problems is on optimizing order quantity or lot-sizing subject to some capacity limitations. In such problems, the objective is either to minimize the total costs associated with the inventory control system including ordering and holding costs or to maximize the benefits associated with the system. The EOQ model has been widely employed along these lines in inventory control systems to determine ordering or purchasing quantity. When the production takes place at a constant rate, the EOQ model is extended to economic production quantity (EPQ). One of the primary assumptions with most lot-sizing models is that demand is constant and is given in planning horizon. However, demand can be affected by different factors such as price and marketing expenditure (Lilian, 1992). The other issue on classical lot-sizing problems is the absence of quality characteristics. Product quality is normally affected by the state of the production process, which may shift from an "in-control" state to an "out-of-control" state and produce defective items (Lee & Rosenblatt, 1987). Hence defective items are produced when the quality characteristics are outside the specification limits and the products cannot be used until the necessary rework is applied. The production process may also produce imperfect quality products and items of imperfect quality could be used in another production/inventory situation that is less restrictive process and acceptance (Salameh & Jaber, 2000). Therefore, imperfect items can be sold to a particular purchaser at a

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