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Economic Production Quantity and Optimal Number of Cycles Considering Rework and Reject Situations

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Abstract
The economic production quantity (EPQ) is a commonly used inventory model. While most of the work has been reported to explore the traditional optimal batch quantity in ideal cases, little appears to have been done with rework option In this paper products are classified in the four groups of perfect products, imperfect products, defective but rework-able products, and, finally, non-rework-able defective products. The percentage of each type is assumed to be constant and deterministic. The objective of this paper is to determine the economic production quantity and optimal number of cycles with rework and reject situations in a single-stage system in which rework is done after N cycles causing less than the desired quantity of good products in each cycle. The model has been validated with illustrating numerical example.

Keywords: economic production quantity (EPQ), rework, reject.

1- Introduction

A difficult situation most manufacturing organizations encounter concerns the difficulties associated with production planning and inventory control. Included among the problems to be dealt with are deciding on raw materials lead time and quantity, adopting the proper type of inventory control model, determining storage capacities, and planning for timely and economical delivery of orders. The main focus of inventory control consists in optimizing order quantity or lot-sizing considering possible capacities and limitations in an attempt either to minimize total costs associated with the inventory control system including ordering costs 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 order quantity or purchase quantity. Introducing the assumption that production takes place at a constant rate, the model has been extended to Economic Production Quantity (EPQ), which has found applications in lot-sizing for manufacturing systems. It needs to be mentioned in passing that it is characteristic of the classical models to assume that all parameters are fixed and known. Moreover, they are normally characterized by the absence of such quality parameters as imperfect products, reworking, scrap, and inspection. However, as the production of imperfect or defective products is a natural expectation, it will be more realistic to integrate quality considerations into the classical models for better compliance with real life manufacturing conditions.

The classical EPQ model has been in use for a long time. It is a well established and widely used technique in inventory management [1]. The EPQ model can be considered as an extension of the well-known economic order quantity, EOQ, model introduced by Harris to minimize total inventory

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