

INVENTORY MANAGEMENT SYSTEM FOR A HIGH MIX, LOW VOLUME MANUFACTURING ENVIRONMENT

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ABSTRACT

Purpose: In today's dynamic market conditions, manufacturers are expected to become more flexible and responsive in meeting demand for customised product specifications and quality requirements. Product mix is becoming more complex and diverse, driving more companies to operate in a high-mix low-volume (HMLV) manufacturing environment. To meet targeted service levels and buffer against uncertainties, manufacturers may commit excessive financial resources into holding excess inventory. This research focus on a real-life HMLV scenario faced a local company that is a provider of defence communication solutions that are fully optimized for individual customers. It offers a wide range of services, where it not only designs its own products, but also manufactures build-to-print microwave modules and components used in dedicated special areas such as intelligence, defence and satellite systems. The environment it operates in is HMLV in nature, where the products assembled may vary in lot sizes, production processes and applications. It can transform assembly lines and change product requirements in a matter of hours, causing its planners to face numerous challenges when planning for the facility's inventory.

Design methodology/approach: This study addresses problems such as excess inventory, stock outs and high inventory costs, by developing an optimal inventory management system for the company.

Findings: A root cause analysis was conducted using a Fishbone diagram. We worked backwards to amass all major and minor causes of high inventory costs, then determine what type of inventory cost they were contributing to. The costs associating with maintaining inventory were determined to be overstocking costs, shortage costs, order costs and storage costs. This exercise was important in pinpointing which aspect we can or want to work on in the subsequent analyses. Also, we developed a classification tool called the ABC-HML analysis to classify our inventory into nine different groups. It incorporated material attrition rates into the solution. The last objective is to evaluate at least two similar inventory management policies and compare its costs as an objective appraisal. We achieve this by using both the EOQ model and its modified version, the JOQ model, to determine an ideal order quantity that is meant to optimise holding and ordering costs.

Research limitations/implications (if applicable): The inventory consisted of items with independent or dependent demand. This limitation could be further research on by applying different inventory models on items with different demand type.

Practical implications (if applicable): The study has demonstrated that systematic approaches should be used in inventory planning because it can reduce costs and provide more certainty in an uncertain environment. The recommendation for the company is to use a more comprehensive inventory management system to determine when and how much to order. It should also make use of the proposed inventory classification tools such as the ABC-HML analysis detailed in this study to classify its inventory. It is an easy way to suss out the characteristics of its inventory so that inventory policies can be tweaked to enhance its application.

Originality/value: The research is undertaken at a company based in Singapore.

Keywords: Inventory Management, High-Mix Low-Volume, Joint order quantity, ABC analysis