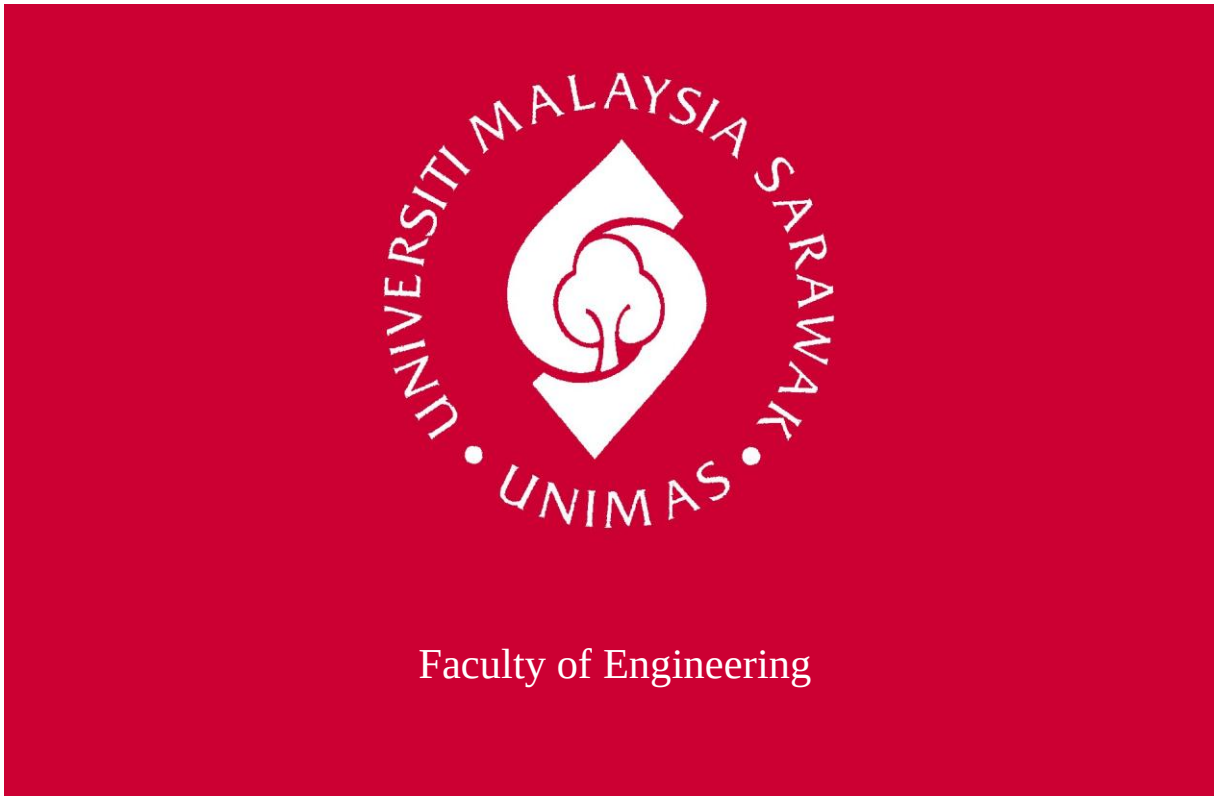

INVENTORY CONTROL PRACTICES

Mohammad Hafiz Bin Amran

Bachelor of Engineering with Honours
(Mechanical Engineering and Manufacturing Systems)
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INVENTORY CONTROL PRACTICES

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This report is submitted in partial fulfillment of
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This project report entitled “Inventory Control Practices” was prepared by Mr. Mohammad Hafiz b. Amran as partial fulfillment of the requirement for the degree of Bachelor of Engineering with Honours (Mechanical Engineering and Manufacturing System) is hereby read and approved by:

_____ _____

Madam Magdalene ak. Andrew Munot Date

(Supervisor)

DEDICATION

To My Beloved Parent, Family and Friends……

ACKNOWLEDGEMENT

In the successful of completion this project, I would like to thanks all parties that have involve and contribute their time, idea and support especially my parents and family members. Their endless support and the love motivate me to accomplish this project. I feel very grateful and thankful for the understanding

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ABSTRACT

Manufacturer's nowadays are competing very competitively among them self. This is to gain the total maximum profit and minimize loss. The objective of this study is to determine the factors that causing poor inventory control practice, the effect of the poor inventory control practice to the company performance or system and lastly the approach for a good inventory control practices. The study is conducted after choosing the appropriate companies before phone call were made to confirm about the research. The interview and the observation session are two methods for collecting data and the questionnaire is to assist the researcher. The data obtained then were transcribed verbatim manually and jotted down for the result of the study. The result shows that the company used Uniplex Business Software UBS system. This system is usually affect by the time varying demand, the inaccurate forecasting, suppliers issue, variable production cost, lack in automation and maintenance and finally the human errors factors. This factors cause the system performance become unreliable. However there are several methods for solving the problem such as rescheduling, multi-supplier, integration between suppliers, forecasting technique and automated manufacturing system. The fully automation system is strongly recommended to increase the production rate since the demand is great.

ABSTRAK

Pengilang pada zaman sekarang bersaing hebat sesama pengilang. Ini adalah untuk memaksimakan keuntungan dan megurangkan kerugian di dalam perniagaan. Tujuan kajian ini dijalankan adalah untuk mengenalpasti punca kelemahan sistem kawalan inventori, kesan kelemahan sistem kawalan inventori terhadap prestasi atau sistem syarikat dan cara-cara untuk mengatasi atau langkah-langkah untuk gerak kerja yang lebih baik. Sebelum kajian ini dijalankan, kilang-kilang yang sesuai telah dihubungi terlebih dahulu untuk mengesahkan perihal kajian tersebut. Borang kaji selidik digunakan untuk membantu penyelidik semasa sesi temu duga dan pemerhatian untuk megumpul maklumat. Maklumat yang di perolehi dianalisa dan dicatat untuk dijadikan sebagai keputusan kajian. Hasil daripada kajian menunjukkan syarikat tersebut menggunakan “Uniplex Business Software (UBS)”. Sistem ini biasanya dipengaruhi oleh issu pembekal, permintaan yand tidak tetap, ketidak tepatan semasa meramalkan permintaan, kepelbagaian harga pembuatan, kekurangan di dalam pengautomatik system dan penjagaan system faktor kecuaian manusia. Bagaimanapun terdapat beberapa cara untuk menyelesaikan masalah tersebut seperti melakukan penjadualan semula, mencari pembekal yang lain, mengadakan persefahaman dengan pihak pembekal, menggunakan kaedah ramalan yang betul serta mengautomatikkan system pembuatan. Untuk mengatasi masalah permintaan yang tinggi dan bagi menambahkan kadar pembuatan, mengautomatikkan system pembuatan adalah amat disyorkan.

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LIST OF ABBREVIATIONS

1. EPLS: Economics Productions Lot Size
2. UBS : Uniplex Business Software
3. USA: Understand Simplify Automate Process
4. FOQ: Fixed Order Quantity
5. POQ: Periodic Order Quantity
6. L4L: Lot for lot
7. CIM: Computer-integrated manufacturing

CHAPTER 1

INTRODUCTION

1.1 Global Competition

Manufacturing firm who produces and sells a single product that is subjected to continuous decay over a lifetime, faces a price-dependent and time-varying demand function, shortages are allowed and a completely backlogged, and has the objective of determining price and production lot-size/scheduling so as to maximize the total profit stream over multi-period planning horizon Chen and Chen (2004). Robinson *et. al.* (2001) mention that, the economic production lot sizing brings a major problem to periodic costs and overtime in a manufacturing process. He stated that, the economic production lot size model (EPLS) need to consider a fixed cost for each period or partial period's production. This periodic fixed cost can model daily equipment cleanup, equipment sanitation costs, day-lot inspection costs, and other fixed charges associated with each time period's production

Krawjewski and Ritzman (2002) claims that, lot sizing rules affect inventory cost, setup and orderings cost. They mention that, choosing a lot-sizing rule can have important implicates for inventory management. According to Toledo and Armentano (2005) the lot-sizing problem over periods of a finite horizon consists of determining how much to produce of each item in order to satisfy the demand in each

period without violating capacity constraints. They believe that, the resulting production plan should minimize the sum of setup, production and inventory costs.

Brahimi *e.t al.* (2004) lot sizing problems are productions planning problems with setups between production lots. They mention that, because of these setups, it is often too costly to produce a given product in every period. On the other hand, generating fewer setups by producing large quantities to satisfy future demands will results high inventory holding costs. Guan, *et al*. (2005) the deterministic lot-sizing problem is to determine the amount to produce in each time period to satisfy the demand for each time period over a finite discrete horizon so as to minimize total set-up, production and inventory holding costs. A study by Hwang and Jaruphongsa (2005) stated that, for demands of a single item, the classical dynamic lot-sizing model focuses on decisions about when and in what quantity to produce or order to minimize the total ordering and inventory-holding costs.

1.2 Economic production lot size

Lee (2004) mention that, an integrated inventory control model, making joint economic lot sizes of manufacturer's raw material ordering, production batch, and buyer's ordering, is developed to minimize the mean total cost per unit time of the raw materials ordering and holding, manufacturer's setup and finished goods holding, the buyer's ordering, and inventory holding. Hence, lot sizing decision is critical to the efficiency of production and inventory systems, Yao & Huang (2004).

1.3 Problem Statement

A manufacturing firm usually made a joint economic production lot size practices due to the time varying demand, production rate, total production quantity, periodic fixed cost and the time constraints, the size of lot or batches and variable production cost to maximize the total profit.

Time varying demand

Tarim and Kingsman (2003) stated that, the practical problem is that in general much, if not all, of the future demands have to be forecast Forecasting errors lead both to stock outs occurring with unsatisfied demands and to larger inventories being carried than planned.

Total production quantity

According to Kalpakjian and Schimd (2001) total production quantity is defined as the total number of parts to be made. They states that this quantity can be produced in individual batches of various lot size which the lot size is greatly influences the economics of production.

Production rate and demand

Larsen and Christian (2005) claims that all production rates should be chosen in the interval between the demand rate and the production rate which minimizes unit production costs, and should be used in an increasing order. This statement is strongly supported by Khouja (2005) stating that demand rate has a direct impact on lot sizing, models which jointly determine optimal price, lot size, and marketing expenditure were developed. Buscher and Lindner (2005) stated that, the production

and rework activities with respect to the timing of operations and also with regard to appropriate lot sizes for both processes while completely satisfying a given demand. Guu (1999) has stated that, multiple lot-sizing problem with rigid demand, the cost structure and yield distribution are two main factors to determine the behavior of such problems.

The size of lot-size in the individual batches

Since the total quantity or the total part to be made can be produced in individual batches of lot various size, but to determine the size is very difficult due the setup cost and inventory holding cost. These two costs must be minimizing to increase profit in joint economics production lot size. According to Krawjewski and Ritzman (2002) lot sizing rule determines the timing and the size of order quantities. They stated that, a lot sizing must be assigned to each item before planned receipts and plan order release can be computed. Buscher and Lindner (2005) mention that, based on total relevant costs per unit time, an optimization method is developed to determine the economic production and rework quantity as well as the corresponding batch sizes for both activities.

Variable production cost

According to research by Chen and Chen (2004) production cost usually depends on the total quantity to be made. This cost can be reduced by a good production planning practice and by implementing the automated manufacturing systems. The flexibility in production can decrease the cost to manufacture the product due to the idle setup of the machine usage. Toledo and Armentano (2005) also stated that, the capacitated lot-sizing problem involving the production of

multiple items on unrelated parallel machines. They believe that, production plan should be determined in order to meet the forecast demand for the items, without exceeding the capacity of the machines and minimize the sum of production, setup and inventory costs.

Lot sizing rule

Krawjewski and Ritzman (2002) claims that, lot sizing rules affect inventory cost, setup and orderings cost. They mention that, choosing a lot-sizing rule can have important implicates for inventory management.

Periodic fixed cost and the time constraints

According to Lippman (1971) economic production lot size model (EPLS) to consider a fixed cost for each period or partial period's production. This is due to determine the optimal production lot size and, hence, the number of consecutive production periods that minimizes the sum of the equipment setup costs, periodic fixed costs, and inventory holding costs. He believes that, all demand must be served without backlogging and without violating each time period's capacity constraints.

1.4 Objective of study

This study aims to investigate the Economic Production Lot Size (ELPS) practice manufacturing company in Kuching. In this new era of competitive manufacturing technologies, the operation and management of the companies is important to minimize cost and maximize profit through the best manufacturing process. So the objectives of this study are as followed:

1) To determine the factor causing poor determination of EPLS practice applied in Kuching manufacturing companies.
2) To investigate the effect of poor determination of EPLS to companies performance.
3) To guide and provide the framework for a good EPLS practice.

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CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This literature review consists of information on the important of Economics Production Lot Size (EPLS) which can help manufacturing firm in the competitive and modern industrial environment. This chapter also includes the factors which causing the poor performance of EPLS system and the information on guidelines or the frame work for the factor which causing the poor EPLS performance.

2.2 The important of Joint Economics Production Lot Size (EPLS)

According to Brahimi *et. al.* (2005) lot sizing is important to satisfy future demands results in high inventory holding costs. This statement is also supported by Krawjewski and Ritzman (2002) stated that the choice of lot sizing rules is important because they determine the numbers of setups required and the inventory holding cost for each item. Robinson (2001) the important of the basic economic order quantity in EPLS model is to determine the replenishment quantity that minimizes the sum of item cost, ordering cost, and inventory holding costs. The goal is to construct a production plan minimizing all relevant costs Heuvel and Wagelmans **(**2004).

According to Kek (2001) the important of EPLS is due to the costs associated with lots size itself such as setup cost, order cost and holding cost. He mention that the larger the size of the lot size, the set up costs may become higher due to the cost of lost production and the cost of scrap associated. Hence the order cost also increase for placing and receiving and order from supplier. The holding cost also increase corresponded to the cost of holding a unit in inventory for a given time period.

2.3 Factor which causing poor performances of EPLS

The world of manufacturing has changed dramatically over the past 20 years. Becoming and remaining competitive is no longer easy (Samson, 1991). Ho (1993) stated that the performance of alternative lot-sizing rules has focused on the total cost of inventory carrying cost and set-up cost. This statement also strongly supported by Krawjewski and Ritzman (2002) which mention that, the lot sizing rules is important because its determine the numbers of setups required and the inventory holding cost for each item. They also stated that choosing a lot-sizing rule can have important implicates for inventory management by affecting inventory cost, setup and orderings cost. Hence, lot sizing rule is one of the factor which causing the poor performance of EPLS.

EPLS performance can also be measure by inventory cost since errors in forecasting inventory will result a significant cost and operating inefficiencies (Dilworth, 1992). He believes that the poor performance of forecasting the inventory will increase relevant inventory cost such as cost of storage for inventory holding, cost of coordination and quality inspection which is the larger lot take longer time to

process or inspect the defective units and has slow movement through the factory. Tarim and Kingsman (2003) had also mention that forecasting errors lead both to stock outs occurring with unsatisfied demands and to larger inventories being carried than planned. This show the forecasting errors will lead to poor performance of EPLS since all companies need to keep all cost of operations at the lowest practicable levels.

2.4 EPLS Practices and method

The guidelines and the framework of the EPLS system is shown according to the problem or the factor which causing the poor performance of EPLS system.

2.4.1 Lot Sizing Rule

Krawjewski and Ritzman (2002) stated that, the choice of lot sizing rules is important because they determine the numbers of setups required and the inventory holding cost for each item. So they have present three lot-sizing rules

1) Fixed order quantity,
2) Periodic order quantity, and
3) Lot for lot.

Fixed order quantity (FOQ)

The fixed order quantity rule maintains the same order quantity each time an order is issued. For example, the lot size might be the size dictated by equipment capacity limits, as when a full a lot must be loaded into a furnace at one time. For purchased items, the FOQ could be determined by the quantity discount level,

truckload capacity, or minimum purchase quantity. Alternatively, the lot size could be determined by the economic order quantity (EOQ)

How ever, if an item's gross requirement within a week is particularly large, the FOQ might be insufficient to avoid shortage. In such unusual cases, the inventory planner must increase the lot size beyond the FOQ, typically to a size large enough to avoid a shortage. Another option is to make the order quantity an integer multiple of the FOQ. This option is appropriate when capacity constraints limit production to FOQ sizes and setup costs are high.

Periodic order quantity (POQ)

The periodic order quantity rule allows a different order quantity for each order issued but tends to issue the order at predetermined time intervals, such as every two weeks. The order quantity equals the amount the item needed during the predetermined time between orders and must be large enough to prevent shortages. Specifically, the POQ is:

POQ lot size		Total gross requirements		Projected on-hand
to arrive in	=	for P weeks, including	-	inventory balance at
week t		week t		end of week t – 1

This amount exactly covers P weeks worth of gross requirements. That is, the projected on-hand inventory should equal zero at the end of the Pth week.