



**UNIVERSITI TEKNIKAL MALAYSIA, MELAKA**

**DEVELOPMENT OF MATERIAL REQUIREMENT PLANNING,  
A CASE STUDY IN METAL INDUSTRY**

This report submitted in accordance of with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor Degree of Manufacturing Engineering (Manufacturing Management) with Honours.

by

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**UNIVERSITI TEKNIKAL MALAYSIA MELAKA**

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I hereby, declared this report entitled “Development Of Material Requirement Planning, A Case Study In Metal Industry” is the results of my own research except as cited in references.

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## **APPROVAL**

This report is submitted to the Faculty of Manufacturing Engineering of UTeM as a partial fulfillment of the requirements for the degree of Bachelor of Manufacturing Engineering (Manufacturing Management). The member of the supervisory committee is as follow:

.....

(Assoc. Prof Dr Adi Saptari)

(Supervisor)

## **ABSTRACT**

This study was conducted at SMI companies which produced metal product. This company has a problem to determine when and how much the quantities of materials, components and parts ordered or to be schedule for production, and also maintaining their records on inventory. The study has developed a Material Requirement Planning (MRP) program based on Microsoft Access and Microsoft Excel. This program function is to provide a plan for production in the company and also help the current inventory system more accurate and efficient. To develop the MRP systems, the project start with identifying and constructing product structure or Bill of Material (BOM), develop data base of inventory which content information for each part, component and finish product, then develop the exploding program. The latest will provide the management a production plan. The scope of this project was focus on four main products that produced at this manufacturing company.

## **ABSTRAK**

Kajian ini telah dijalankan di sebuah syarikat yang termasuk dalam syarikat-syarikat kecil dan sederhana yang mengeluarkan barangan logam. Syarikat ini mempunyai masalah tentang bila dan berapa kuantiti bahan mentah serta komponen yang perlu dipesan atau ditetapkan untuk proses pengeluaran serta bagaimana mereka untuk mengekalkan rekod inventori mereka dengan baik. Melalui kajian ini, telah dibangunkan sebuah sistem dengan menggunakan perisian Microsoft Access dan Microsoft Excel untuk menjadikan ia sebagai sistem Perancangan Pengeluaran Bahan yang mana fungsinya dapat digunakan untuk menjadikan sistem inventori yang sedia ada lebih tepat dan efisien. Untuk membangunkan sistem ini, ia dimulakan dengan mengenalpasti dan membina struktur produk itu sendiri seperti bilangan material yang terdapat pada setiap produk itu, membangunkan data inventori di mana ia merangkumi maklumat untuk setiap bahagian serta komponen dan produk akhir yang akan dihasilkan sebelum menghasilkan sistem tersebut. Ruang lingkup untuk projek ini adalah tertumpu pada empat produk utama yang dihasilkan di syarikat perkilangan ini.

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I would like to dedicate special thanks to my:

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# LIST OF ABBREVIATIONS AND SPECIALIZED NOMENCLATURE

RFID	-	Radio Frequency Identification
MRP	-	Material Requirements Planning
PSM	-	Projek Sarjana Muda
JIT	-	Just in Time
BOM	-	Bill of Material
TM	-	Telekom Malaysia
TNB	-	Tenaga Nasional Berhad
CPHR	-	Clamp Pole Head Ring
CPSP	-	Clamp Pole Step Pole
CPSI	-	Clamp Pole Step Iron
UPC	-	Universal Product Code
WIP	-	Work in Progress
EOQ	-	Economic Order Quantity
MPS	-	Master Production Scheduling
$D$	-	Demand rate (in units per year)
$A$	-	Setup cost
$h$	-	Holding cost
$Q$	-	Lot size (in units)

# CHAPTER 1

## INTRODUCTION

### 1.1 Background

In the manufacturing business now, the competition not only how many products can be producing, but on how competitive is a product on regard to cost delivery, quality, and time. There is no point to produce many of products but in the end the product cannot be sold. When these problems occur, it will cause the loss for company because of the fail in inventory management system. The situation become a key point mentioned about how important inventories nowadays in organization. For example Batesville Casket Company produced and distributed high-quality caskets and memorial products and is a leader in the North American funeral products industry. The company was challenged to effectively schedule production, manage inventory, and deliver product in a timely fashion. The company implemented proprietary finished goods storage system and barcode scanning devices. That system has played an important role in enabling to improve their business processes with a simpler way to gather and process the inventory data in real-time in the enterprise application. Every unit in the system is packaged, labeled, and stored. To fill an open order, the system automatically selects a unit, and moves it into the conveyor control applications, and completes the shipment. As a result, the company knows the status of in-transit items, as well as counts for products on hold. Inventory accuracy for this company has increased to over 99.9%. Other than that, they also reduced misplaced inventory to less than 10 units per year and reduced time required for cycle count.

## 1.2 Problem Statement

Most of the companies have a financial problem caused by a poor of inventories control systems. The problems occur when the company had overstocking items which means that the item is much than demand. This is cause by the undefined of how much and when to make the order of material which is consider with Material Requirement Planning (MRP).So that the inventory cost will increase and it become worst to the company. Other than that, if the items is under stocking it results the missed of deliveries, lost of sale, production bottleneck, and dissatisfied customers. All this make the company profit and credibility falls down drastically. Because of that, inventories system are created to prevent this entire problem before occur.

By doing forecasting on demand pattern and develop a MRP table, company can plan when to buy, how many to buy, and what to buy to ensure that all the bought items is useful and not to make the storage area narrow. The result is cost for the storage area will not increase and it become a profit to company. Besides that, all the item data such as items quantity, color, and placed for that particular item can be identified quickly if the company implement this inventory control systems properly.

The companies have the problems about their current inventories system where their orders quantity is not suit with current production rate. The effect from that situation, they need a lot of space to place that material. Other than that they also do not know how the exactly quantities for work in progress (WIP) items and they cannot keep track of these WIP. Recounting at the items become redundant jobs which not only take time but also cost. Realizing this situation, the company needs a proper Material Requirement Planning and inventory management system as a tool to assist the company to reduce their inventory cost and planned their production time. In addition, they can simply determine their capacity and ability to produce and to fulfill the demand from their customers.



### **1.3 Objective**

The objective of this project as followed below:-

- i. To identify current inventory problems and material planning in the company
- ii. To design and develop a Material Requirement Planning (MRP) software

### **1.4 Scope**

This company under study produces many types of product. This study will focus on suspension hook and clamp pole only. The company will cover any other things are:-

- i. Rearrange the placement for the suspension hook and clamp pole part and child part item.
- ii. Develop the inventory systems for suspension hook and clamp pole part.

## 1.5 Project Outlines

Based on the thesis for Projek Sarjana Muda (PSM) I, an organization has been constructed for the process flow of completion in order to fulfill course of Degree in UTeM. Below shows the format of the organization:

Chapter 1, basically gives an introduction to the project which is including objective, scope, and background. In this chapter, it explain clearly hoe the subtopic influence each other in this project.

Chapter 2, this chapter represents literature review on the background and basic information about the inventory control system which explains the theories used in this project.

Chapter 3, represent about methodology of this report which have the information of procedure on the project conducted.

Chapter 4, shows the result and analysis of data finding, in this chapter the data collected based on case study and analyzed stage by stage to show the good result.

Chapter 5, represents the discussion on the result of the study. It is stressing the significance and implementations of the project findings.

Chapter 6 is the conclusion of the project which summaries of the report and this chapter reference to the objective and scope of project.

## **CHAPTER 2**

### **LITERATURE REVIEW**

This chapter include some of basic information about Material Requirement Planning (MRP) and inventory management system. Other than that, in this chapter is also mention about the related topics in material requirement planning and some research studies that used to make it clearly to understand all about the philosophy of inventory particularly.

#### **2.1 Inventory**

Every current operations management textbook contains a chapter with a title like “inventory management” (Heizer and Render, 2006), or “inventory planning and control” (Slack et al., 2004). An inventory is basically about stock of item kept by an organization to meet internal or external customer demand. Inventory is a vital part of an organization. This is because inventory represent 45% to 90% of all expenses for the organization business to make sure that they have the right goods on hand to prevent from stock-out, shrinkage and provide proper accounting plan. For many companies, inventory management represents a key success factor; as Silver et al. (1998) suggest, a company’s fate depends on how it manages its inventory. Inventory is a complex problem area owing to the diversity of real life situations. Successful inventory management requires sophisticated methods to cope with the continuously changing environment. Inventory is also to keep balance between the lost due to non-availability of an item and cost of carrying the stock item. These decisions are about how much to order, when to order to replenish inventory to an optimal level in order to get customers satisfaction in term of punctuality in delivering order and lead time (time to wait after ordering until the product deliver to customer).

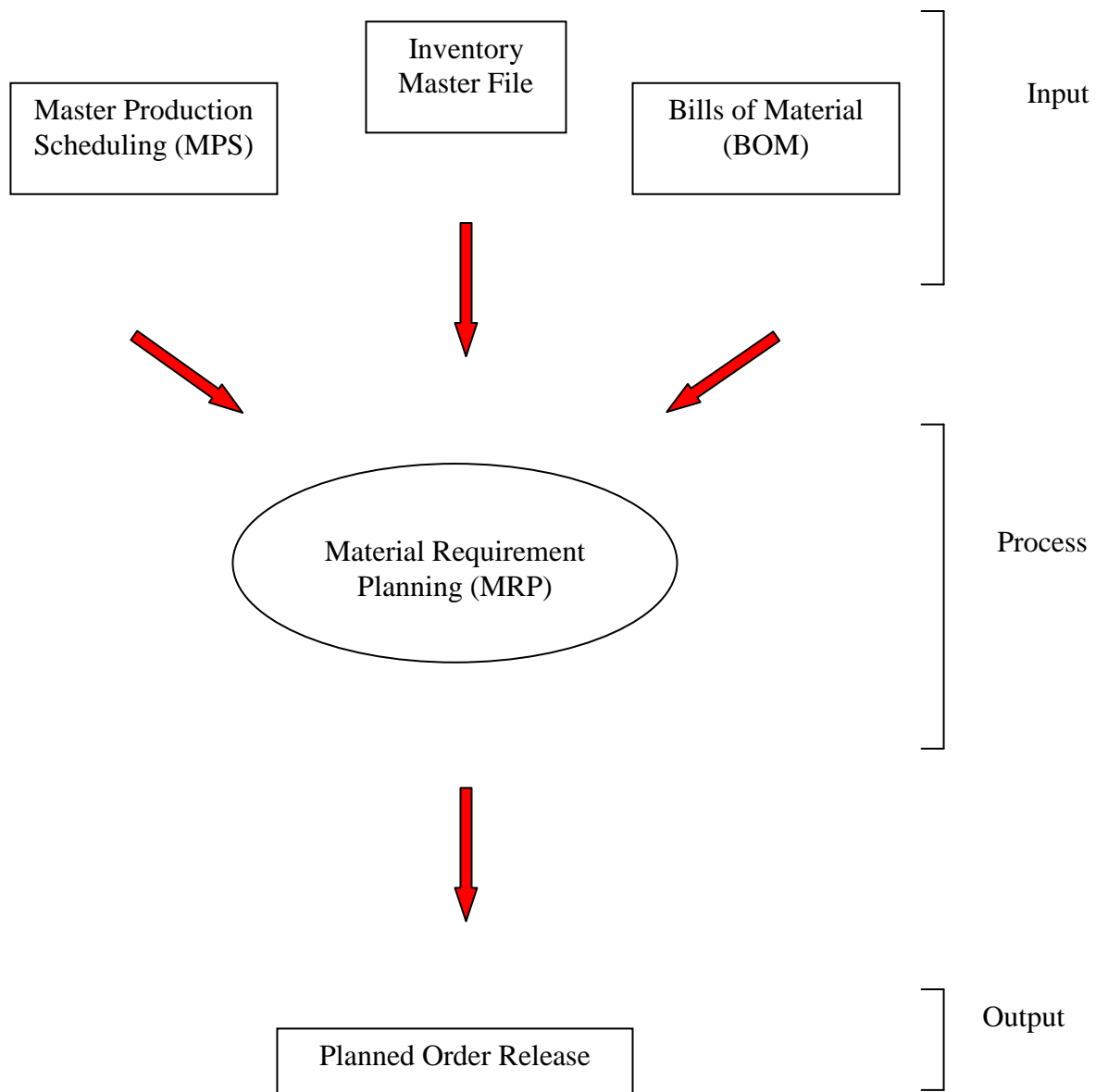
The ideal inventory and proper merchandise turnover will vary from one market to another. Average industry figures serve as a guide for comparison. Too large an inventory may not be justified because the turnover does not warrant investment. On the other hand, because products are not available to meet demand, too small an inventory may minimize sales and profits as customers go somewhere else to buy what they want where it is immediately available. Minimum inventories based on reordering time need to become important aspects of buying activity. Carrying costs, material purchases, and storage costs are all expensive. Other than that, the damaged of item in inventory also must be responsible by the company. However, stock-outs are expensive also. Because of that, the applying of inventory is to maintaining optimum level of stock of goods required by the company at minimum cost. Bad inventory management enables to make the organization loss their profit. All of those costs can be minimized by efficient inventory management.

From Sung and Yang (1993) research, defines MRP as computerized materials/production planning and control system for production only. The majority of Egypt companies indicate that the MRP system is regarded as a tool for planning and control production (Salaheldin and Francis, 1998).

Material Requirement Planning (MRP) has been the most widely implemented large-scale production management system since the early 1970s, with several thousand MRP type systems implemented in industry around the world. MRP is a time series analysis tool which used to plan purchasing and production to meet customer demand. This tool is really helpful because it will determine the entire components at a right time, right part and right quantity. Furthermore MRP also will provide a time schedules to order a parts or raw material.

## **2.2 Material Requirement Planning (MRP)**

Material Requirement Planning (MRP) has been the most widely implemented large-scale production management system since the early 1970s, with several thousand MRP type systems implemented in industry around the world. MRP define as computerized materials/production planning and control system for production only (Sung and Yang, 1993). MRP is a time series analysis tool which used to plan purchasing and production to meet customer demand. The majority of Egypt companies indicate that the MRP system is regarded as a tool for planning and control production (Salaheldin I and Arthur Francis, 1998). This tool is really helpful because it will determine the entire components at a right time, right part and right quantity. Furthermore MRP also will provide a time schedules to order a parts or raw material. This is complete MRP system as shown in Figure 2.1 that consist input, process and output. From Seyed - Mahmoud (2003), he divides MRP main components into five which is the Master Production Scheduling (MPS), Bill of Material (BOM), inventory available, purchase order and lead-times. Usually MRP system has three main inputs which are Master Production Scheduling (MPS), Bill of Material (BOM) and inventory master computer record (Salaheldin I and Arthur Francis, 1998).



**Figure 2.0:** MRP System (Salaheldin I and Arthur Francis, 1998).

### **2.3 MRP Objective**

The main of MRP objective can be show below are:

- (i) Inventory reduction: MRP helps to purchase the component at the right time, right components and right quantity.
- (ii) Reducing in the manufacturing and delivery lead times: MRP help to avoid delays in production activities.
- (iii) Provide delivery commitments: MRP can assure timely information about delivery times to prospective customers.
- (iv) Increase the efficiency: MRP provides a close coordination among various workstations.

### **2.4 MRP Advantages**

When implement on MRP system, there are several benefits with the implementation of MRP in Small and Medium Firms by Albertini (2002); Duchessi et al. (1998); Anderson et al.(1982); Laforge and Sturr(1986) and Schroeder et al. (1981) such as:-

- 1) Better ability to meet volume changes
- 2) Better capacity planning
- 3) Reduced safety stocks
- 4) Reduced inventory costs (supervising and controlling)
- 5) Better meeting of delivery promises
- 6) Better product customization
- 7) Better production scheduling
- 8) Reduced costs (materials)
- 9) Better cost estimation
- 10) Reduced delivery lead times

## **2.5 MRP Inputs**

MRP also have their main output that is the desired things by doing this system. According to Seyed - Mahmoud (2003) and Heizer J., and Render B., (2006), MRP main components have been divides into five which is the Master Production Scheduling (MPS), Bill of Material (BOM), inventory available, purchase order and lead-times. Usually MRP system has three main inputs which are Master Production Scheduling (MPS), Bill of Material (BOM) and inventory master computer record (Salaheldin: Francis, 1998, Sriskandarajah C. 2008 and Ramba F.).

There are several input components in MRP and it is compulsory to defined it before develop a software. These inputs should be accurate because the information will be used when to make an order by using the MRP software referring to Seyed - Mahmoud (2003) and Ravi et al. (2005) research and they both are agree . Firstly, the Master Production Scheduling (MPS) will deal with the quantity of product and the due date. Secondly, the Inventory Master File which consist a detail about stock and material lead time. The last item is Bill of Material (BOM) or in other word is product structure tree for the product.

### **2.5.1. Master Production Scheduling (MPS)**

Master production schedule (MPS) is a basically diagram use to specify which end items or finished products a firm is to produce, how many are needed, and when they are needed. Production planning creates a similar schedule for product lines or families, given by months. An MPS is usually expressed in days or weeks and may extend over several months to cover the complete manufacture of the items (Petroni A., and Rizzi A., 2001).

From Seyed-Mahmoud (2003), Sparling D. and Petroni A: Rizzi A., (2001) there is a similarity between them on purpose of MPS which are:-