

MOTORCYCLE PARTS INVENTORY MANAGEMENT SYSTEM

Ailada Treerattrakoon
Department of Industrial Engineering, Faculty of Engineering,
Kasetsart University, Thailand
fengadt@ku.ac.th

Tanaporn Lersbuasin,
Department of Industrial Engineering, Faculty of Engineering,
Kasetsart University, Thailand
tanapon.ler@hotmail.com

Abstract:

The objective of this study is to design an inventory management system for motorcycle parts manufacturing in order to control inventory of raw material, forecast demand and schedule production planning. The system includes storage for inventory, an indicator for monitoring the motorcycle parts and reporting the level of current inventory of the items. The integrated information on the status of inventory is used to decide whether an order for the inventory should be made. This system helps to keep track the flow of products and supplies faster and reduce the total inventory cost.

Keywords: motorcycle parts inventory, inventory management, inventory system, production planning

1. INTRODUCTION

There is a high competition in small and medium enterprises in Thailand. Production planning and control are important tools to optimize utilization of capacity, time and cost of production. A case study of motorcycle part manufacturer has sufficient labor, machine, experience and skill, but lack of efficient management system causing production efficiency is not high. Make-to-stock production has been applied due to entrepreneur's experience including raw material ordering and production schedule. There is not an inventory management system which provides inventory record and status to integrate all information in order to make a good decision for the entrepreneur.

This research is aimed to design the inventory management system to record inventory, present inventory status and inventory shortage warning, including forecasting raw material input. The inventory management system design is developed to be easy use and appropriate for motorcycle part manufacturer. All inventory records have been applied to forecast raw material input, implement the inventory management system, determine raw material reorder point and production schedule, and estimate cost for each product.

2. PROBLEM ANALYSIS

The motorcycle part manufacturer has more than 774 products. The main raw material is aluminum which has at least 110 types. Product characteristic is anodized aluminum as figure 1.

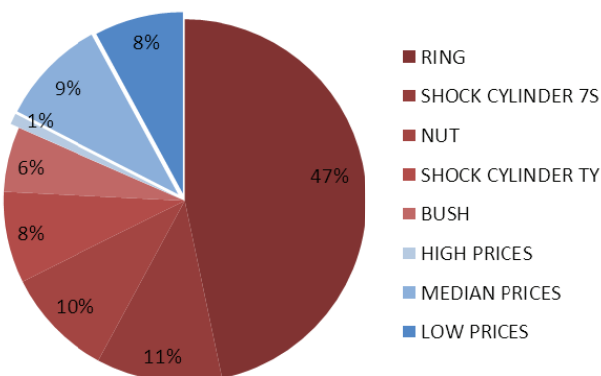
Figure 1: Anodized aluminum



Source: A case study of motorcycle part manufacturer

There are more than 945,000 pieces of work in process (WIP) inventory. Product cost has never been calculated. Make-to-stock production is based on entrepreneur's decision. Product groups can be categorized by demand as figure 2.

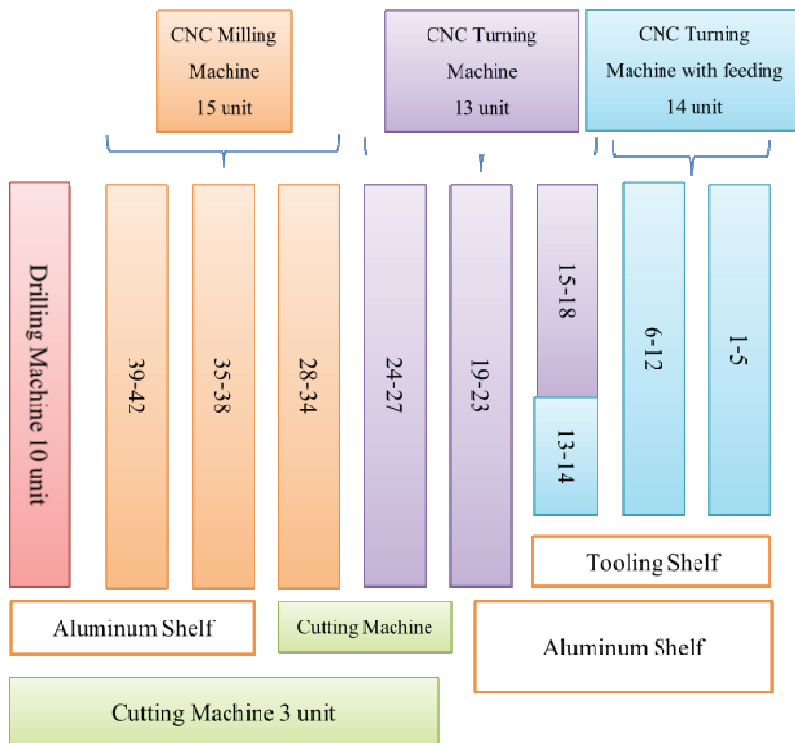
Figure 2: Product groups' demand



Source: A case study of motorcycle part manufacturer

There are 42 CNC machines which are 14 CNC turning machines with feeding, 13 CNC turning machines, 15 CNC milling machines, 10 drilling machines, and 3 cutting machines with layout as figure 3.

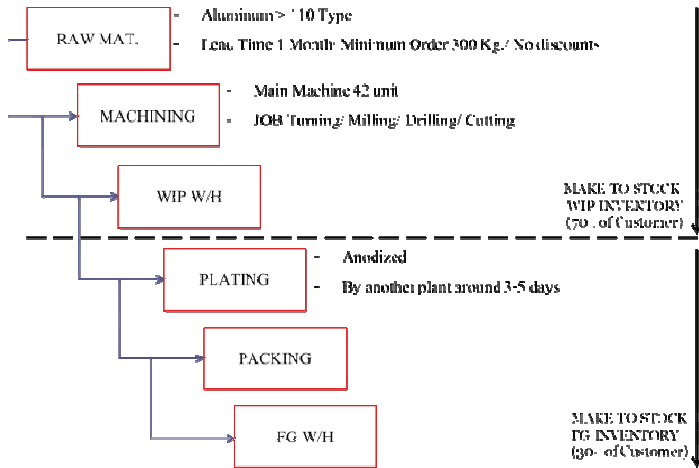
Figure 3: Machines layout



Source: A case study of motorcycle part manufacturer

Production process from raw material to finish goods is as figure 4.

Figure 4: Production process

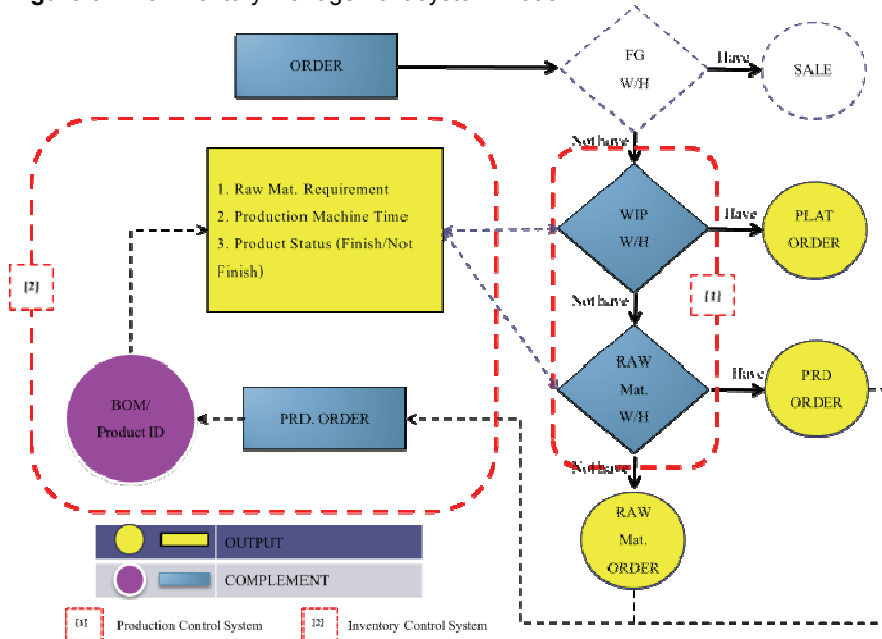


Source: A case study of motorcycle part manufacturer

3. THE INVENTORY MANAGEMENT SYSTEM DESIGN

The inventory management system model is as figure 5.

Figure 5: The inventory management system model



Source: A case study of motorcycle part manufacturer

Raw material inventory and non-anodized products inventory should provide stock status, reorder point, safety stock, economic production quantity (EPQ), and economic order quantity (EOQ) which can be accessed via computer network in the motorcycle part manufacturer. When customer order arrives, types and quantities of required products will be converted to types and quantities of required raw material to fulfill customer order and satisfy safety stock. Production time will be estimated to schedule production planning. The designed inventory management system has been developed in 3 Excel files.

3.1. Raw material

Capability: Presenting, warning, and forecasting inventory of raw material status.

Input: Quantities and date of receiving and using raw material (in and out).

Output: Balance, safety stock, EOQ, and monthly forecasting of raw material.

There are 3 spread sheets in this file which are AddmatData sheet, Balance Mat sheet, and Kg Mat Data sheet.

AddmatData sheet

AddmatData sheet is used to record quantities and date of receiving and using raw material as figure 6.

Figure 6: AddmatData sheet

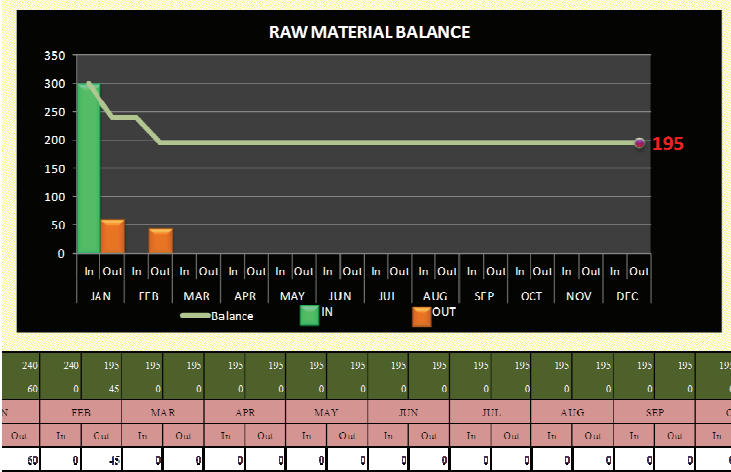
ผู้ซื้อ	เลขที่ใบกำกับภาษี	วันที่รับ	MONTH รับ	ผู้รับ	จำนวน(เส้น)	จำนวน(ก.ก.)	รวม
		04/02/15	ก.พ.	ท.น.พ.	8.00		
		04/02/15	ก.พ.	ท.น.พ.	315.00		

Source: A case study of motorcycle part manufacturer

Balance Mat sheet

Balance Mat sheet presents balance of raw material as figure 7.

Figure 7: Balance Mat sheet

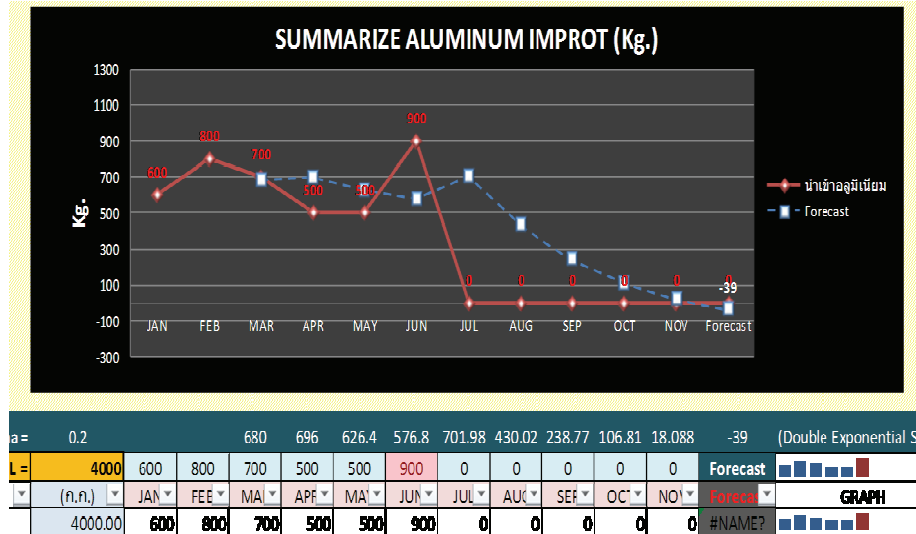


Source: A case study of motorcycle part manufacturer

Kg Mat Data sheet

Kg Mat Data sheet presents forecasting of raw material as figure 8.

Figure 8: Kg Mat Data sheet



Source: A case study of motorcycle part manufacturer

3.2 Work in process inventory

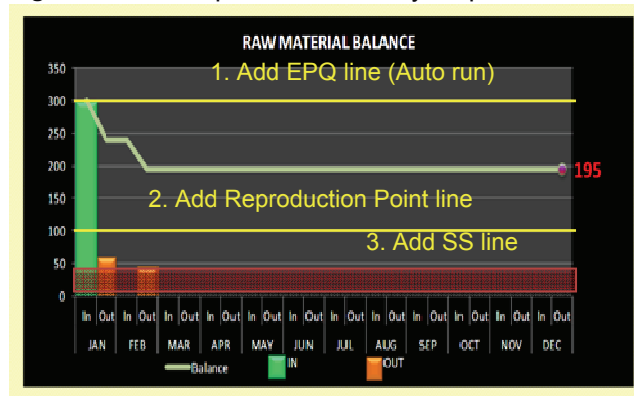
Capability: Presenting, warning, and forecasting inventory of non-anodized products status.

Input: Quantities and date of receiving and using non-anodized products (in and out).

Output: Work in process balance, reproduction point, safety stock, and economic production quantity of non-anodized products.

Work in process inventory file will present reproduction point, safety stock, and economic production quantity of non-anodized products as figure 9.

Figure 9: Work in process inventory output



Source: A case study of motorcycle part manufacturer

3.3 Production input

Capability: Determining production schedule and summarizing required raw material and required production time.

Input: Quantities of required products and production schedule.

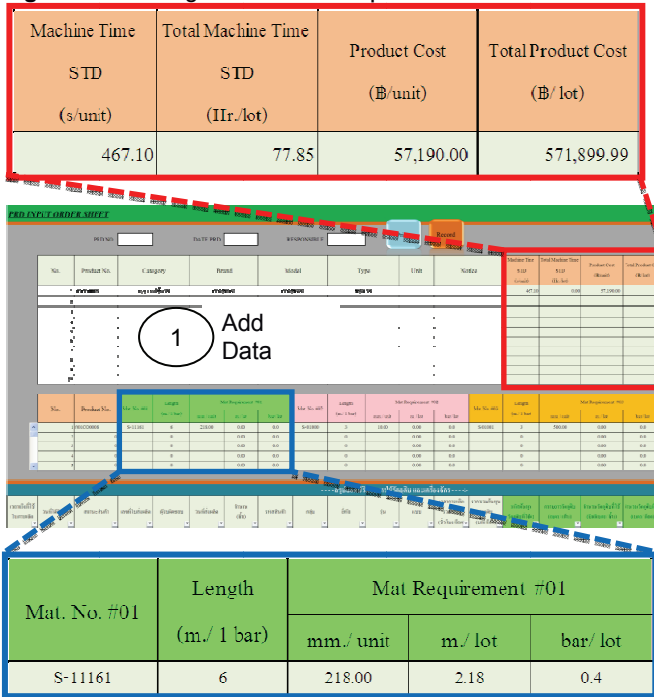
Output: Required products, required production time, total usage of raw material in selected period, and total usage of production time in selected period.

There are 4 spread sheets in this file which are PRD Input Order sheet, BOM Database sheet, Mat Database sheet, and PRD Order Print Out sheet.

PRD Input Order sheet

PRD Input Order sheet is used to record and determine production schedule. When adding data, system will calculate required products, required production time as figure 10.

Figure 10: Adding data in PRD Input Order sheet



Source: A case study of motorcycle part manufacturer

When saving file, all data will collected in database to calculate total usage of raw material in selected period and total usage of production time in selected period as figure 11.

Figure 11: Total usage of raw material in selected period and total usage of production time in selected period

Machine			Material				
Total Machine Time	15.75	Hr.	Total Mat. Requirement	45.9	m		
Cutting	3.30	Turning	0.19	Milling	0.16	Plane	2.93
				File	2.57	Drilling	2.20
						Assembly	1.83

Source: A case study of motorcycle part manufacturer

After that the inventory management system will present production status as figure 12.

Figure 12: Production status

Actual Time	Receive Date	Status	PRD No.
2	03/01/15	Finish	PRD15-01
3	04/01/15	Finish	PRD15-02
4	05/01/15	Finish	PRD15-03
-42005		Not yet	PRD15-04
-42005		Not yet	PRD15-05

Source: A case study of motorcycle part manufacturer

Production operator can print out production order as figure 13.

Figure 13: Production order

PRD13-01		PRODUCTION ORDER			print date	10.2.2015
To Production Department						
Please prepare machine and produce follow below table						
ชื่อสินค้า						
No.	Product No.	Category	Brand	Model	Type	unit
1	101000005	เครื่องยนต์ 75	COOLBOX	COOLBOX	ดีดี-75	10

Source: A case study of motorcycle part manufacturer

4. SUMMARY

Before applying the inventory management system, recording, calculating, and checking status were made by man that took long time and was difficult to develop. After applying the inventory management system, the motorcycle part manufacturer has necessary database which provides production schedule, inventory status, total usage of raw material and total usage of production time, and other necessary information to help workers work faster and entrepreneur make a right decision due to updated information. Time to check inventory status has been reduced from 30 min to 3 min. Time to determine production schedule also has been reduced from 30 min to 3 min.

REFERENCE LIST

1. Apisit Wiwatyotinchai. (2011). *Genetic Algorithm for Determination of Replenishment Policy in One-warehouse and Multi-retailer System. (Master's Thesis)*. Kasetsart University, Bangkok.
2. Ata Allah Taleizadeh Seyed Taghi Akhavan Niaki (2010) Multiproduct single-machine production system with stochastic scrapped production rate, partial backordering and service level constraint *Journal of Computational and Applied Mathematics*, 233, 1834-1849.
3. Bantita Jamjun. (2013). *Development of MRP Framework for Job Shop Environment. (Master's Thesis)*. Kasetsart University, Bangkok.
4. Barriga, E. M., J. G. Jeong, M. Hastak and M. Syal. (2005). Material control system for the manufactured housing industry. *ASCE, Journal of Management in Engineering* 2005, 21, 91-98.
5. Gopalakrishnan, P. (1976). Inventory problems in public sector enterprises in India. *International journal of physical distribution & Logistics management*, 6, 135-143
6. Karn Kankanok (2009) *VBA Spreadsheet Simulation Add-Ins for Microsoft Excel (Master's Thesis)*. Kasetsart University, Bangkok.
7. Kittisak Saen-Un. (2009). *A Development of Inventory Control Flow Software: A Case Study of Agricultural Input's Retailers. (Master's Thesis)*. Kasetsart University, Bangkok.
8. Petch Kloumkiange. (2010). *Inventory Management of Housing Development Project in Bangkok Metropolitan Area. (Master's Thesis)*. Kasetsart University, Bangkok.
9. Sasiprapa Limpakarn. (2013). *Multiple Items Economic Production Quantity with Raw Materials and Components Inventory Management System. (Master's Thesis)*. Kasetsart University, Bangkok.
10. Siriluk Piyatraiphoom. (2013). *Material Inventory Management for Corn Processing Plant. (Master's Thesis)*. Kasetsart University, Bangkok.
11. Surachate Tepkaew. (2010). *Application of Lean Manufacturing Techniques for Inventory Reduction. A Case Study of Sanitary Fitting Manufacture. (Master's Thesis)*. Kasetsart University, Bangkok.
12. Surat Suktor. (2010). *Setting Safety Stock Levels for Products with High Variability in Demands. (Master's Thesis)*. Kasetsart University, Bangkok.
13. Viroj Petchking. (2006). *Improvement of Inventory Policies for Raw Materials with Uncertain Demand in a Ceramics Tableware Manufacturing Company. (Master's Thesis)*. Kasetsart University, Bangkok.