UNIVERSITI PUTRA MALAYSIA

**DEVELOPMENT OF A PRODUCTION PLANNING AND CONTROL
SOFTWARE IN TOTAL PRODUCTIVITY MAINTENANCE
ENVIRONMENT**

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FK 2004 30

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UNIVERSITI PUTRA MALAYSIA**

2004

DEVELOPMENT OF A PRODUCTION PLANNING AND CONTROL SOFTWARE IN TOTAL PRODUCTIVITY MAINTENANCE ENVIRONMENT

By

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**Thesis Submitted to the School of Graduate Studies,
Universiti Putra Malaysia, in Fulfil ment of the Requirements for the
Degree of Master of Science**

April 2004

1

DEVELOPMENT OF A PRODUCTION PLANNING AND CONTROL SOFTWARE IN TOTAL PRODUCTIVITY MAINTENANCE ENVIRONMENT

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Faculty: Engineering

Successful modern manufacturing organizations require support from both effective and efficient maintenance works. One of the approaches for improving the performance of both production and maintenance is by developing and implementing a Total Productive Maintenance (TPM) strategy. The main objectives for this study is to develop a production planning and control (PPC) software in a TPM environment for a manufacturing company and improve the overall production planning and control system from manual recording to computer aided recording which includes some planning features such as Master Production Scheduling (MPS), monthly capacity planning, operation scheduling and other requirements.

A TPM based software program has been developed to ease the process of production planning and control in TPM environment by executing sequential methodology such as problem identification, literature review, problem

formulation, data collection, company operation review, flow chart system and program algorithm before test run in the company. This program has been created in Window format and encoded using Microsoft Visual Basic 6.0. This software was tailored design based on the present operation at Earntrade Industries which practise Earliest Due Date (EDD) and Short Processing Time (SPT) performance measures.

This software has been evaluated at Earntrade Industries for a period of two months to test the overall performance of the application software relevant to the project goal. The system which change from manual to computer aided recording manage to decrease the handling time from manual to computer aided recording by 89.22 % and avoid 100% unwanted human error .

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia
sebagai memenuhi keperluan untuk ijazah Master Sains

PEMBANGUNAN PERISIAN RANCANGAN PENGELUARAN DAN KAWALAN DALAM PERSEKITARAN TOTAL PRODUCTIVITI MAINTENANCE

Oleh

Lee Pang Seng

April 2004

Pengerusi: Profesor Madya Megat Mohamad Hamdan Megat Ahmad, Ph.D

Fakulti: Kejuruteraan

Organisasi pengilangan moden yang berjaya memerlukan sokongan padu daripada keberkesanan dan kecekapan penyelenggaraan tugas kerja. Salah satu pendekatan untuk memperbaiki prestasi kedua-dua pengeluaran dan penyelengaraan adalah dengan membangun dan melaksanakan strategi TPM. Objektif utama penggajian ini adalah untuk merekabentuk perisian perancangan dalam persekitaraan TPM dalam kilang pengeluaran dan mempertingkatkan keseluruhan mutu perancangan dari catitan manual kepada catitan computer di samping melibatkan sebahagian ciri ciri perancangan seperti Perancangan Pengeluaran Induk (MPS), perancangan kapasiti bulanan, perancangan operasi dan keperluan lain.

Sebuah perisian berasaskan TPM telah direkabentuk untuk mempermudahkan proses perancangan pengeluaran dalam persekitaran TPM dengan melaksanakan kaedah sekuen seperti mengenalpasti masalah, penyelidikan literasi , perancangan masalah, koleksi masalah, pembelajaran operasi kilang, sistem carta dan algoritma program sebelum pengujian perisian di syarikat tersebut. Program tersebut telah

direkacipta dalam bentuk tetingkap dengan penggunaan perisian Microsoft Visual

Basic 6.0. Program ini telah direkabentuk secara khusus berpandukan operasi syarikat Earntrade Industries pada masa tersebut, iaitu Tarikh Luput Terawal (EDD) dan Pemprosesan Masa Tersingkat (SPT).

Perisian tersebut telah diuji di Earntrade Industries untuk tempoh dua bulan untuk mengukur kadar keberkesanan aplikasi perisian tersebut terhadap matlamat projek. Sistem yang bertukar dari catitan manual kepada catitan computer berupaya mengurangkan perlaksanaan masa sebanyak 89.22 % and mengelakan 100% sebarang masalah.

ACKNOWLEDGEMENTS

First and foremost, I would like to express my sincere thanks and deepest appreciation to my honorable supervisors, Associate Professor Dr. Megat Mohamad Hamdan Megat Ahmad, Associate Professor Ir. Dr. Md. Yusof Ismail, Associate Professor Dr. Shamsuddin Sulaiman, and Associate Professor Dr. Napsiah Ismail for their untiring support, invaluable guidance, advice and assistance throughout the entire duration of the project. I am honored to become one of their post graduate students as I believe that they are the best engineering lecturers that I had ever known.

Besides that, I am also very grateful to my wonderful teammates Benedict Lim Chin Khian and Wang Chia Wu who rendered help towards the completion of this project. Furthermore, I would like to take this opportunity to thank all the staff of Earntrade Industries especially Thiagu Balakrishna (QA Asst Manager), Y.Y.Kow (Personal Assistant) and Goh Chyin Tar (Executive Director) for their utmost support, suggestions and comment.

Last but not least, I wish to thanks again my beloved mum, dad and sister for being the pillar of strength throughout the process of the project.

TABLE OF CONTENTS

Page

LIST OF FIGURES

LIST OF ABBREVIATIONS

AMT	:	Advanced Manufacturing Technology
APP	:	Aggregate Production Plan
ATP	:	Available to Promise
BMP	:	Windows Bitmap
BRP	:	Business Resource Planning
DO	:	Delivery Order
ERP	:	Enterprise Resource Planning
GIF	:	Graphic Interface Format
GUI	:	Graphical User Interface
IDE	:	Integrated Development Environment
JPEG	:	Joint Photographic Expect Group
MDI	:	Multiple Document Interface
MPC	:	Manufacturing Planning System
MPS	:	Master Production Scheduling
MRP	:	Material Requirement Planning
MSVB	:	Microsoft Visual Basic
OEE	:	Overall Equipment Efficiency
OLE	:	Object Linking and Embedding
OPT	:	Schedule according to bottleneck resources
PIC	:	Person In charge
PM	:	Preventive Maintenance
PO	:	Purchase Order
PPC	:	Production Planning and Control
PSD	:	PhotoShop

QS	:	Quality System
ROP	:	Reorder point based system
SAP	:	System Application and Products
SDI	:	Single Document Interface
SMI	:	Small and Medium Industries
TIFF	:	Tagged Image Filed Format
TPM	:	Total Productive Maintenance
TQM	:	Total Quality Management
VB	:	Visual Basic
WIP	:	Work In Progress
Co.Ltd	:	Company Limited

CHAPTER 1

INTRODUCTION

1.1 Effect of Globalization

The globalization of markets to some manufacturer may mean opening up or capturing a larger market for their manufactured goods but to many others it may mean that competitors are at their doorstep. In the era of e-commerce, globalization is a form of fierce competition between local and foreign competitors, which they have to compete with an expanding range of lower price and high quality product. As a result, it is believed that future competition will come from central and eastern nations aside from Asian countries and most of these countries have reached a stage where its firms finds it difficult to compete in industries where labor cost are the most significant factor in competitiveness. Without doubt, globalization has reached a stage where achieving national competitiveness is crucial in order to survive for future globalization market. [1]

1.2 Importance of Study

Industries that can compete in today's global market will be those that can win in global competition, not those who hide under the nation shelter in a form of tariff protection against foreign manufacturer. This has resulted many firms that choose to stay competitive has to face competition from world class suppliers. According to Yusof Ismail and Hashmi, only total quality management (TQM) can produce world class suppliers. [1]

16

Modern technologies have made it possible to build modern factories anywhere in the world. This impact has raised the quality life of people in the region and resulted in an increase in the demand of higher lower price products and service with on time delivery. In addition, manufacturers in developed nation face higher labor cost, reduced profit margin, tighter government regulation and increase product diversity. All these increase need for firms to be more efficient in their operation.

In the business language today, becoming more efficient mean changing and focusing on the quality culture. This is why Total Productive Maintenance (TPM) has been selected to improve and sustain total quality with the hope to improve the firm global competitiveness. [1]

1.3 Problem Statement

Earntrade Industries Sdn Bhd, starts operation in 1995, is a joint venture with Marui Industrial Co.Ltd, a leading Japanese concern in surface treatment technologies. The company offers its customers a competitive edge by continuous reinvestment in the latest and state of the art technologies and continuous development to achieve cost efficiency, product quality and on time delivery.

Earntrade Industries also practices ISO and QS 9000 quality systems and 5S housekeeping system to meet international quality expectations. Since then, quality initiatives have been seen as critical for greater competitiveness and have gained much attention from the top management under the Japanese management

principle. This has resulted in a widespread adoption of quality certification such as QS 9000 and ISO 9002.

Generally, TPM is primarily to maximize the effectiveness of the equipment throughout its entire life by the participation and motivation of the entire workforce of the company. In the respect, the maintenance will not only require parts to be repaired but also need to be replaced whenever necessary. Parts need to be available whenever it is required. As such, the production planning and control system available needs to be able to fulfill the requirement. Moreover, the transaction in the production planning and control are manually written and recorded. This caused unnecessary man, machine, method and material losses such as human error, poor production planning, untraced delivery order record and overuse of material.

At present, no studies have been found which relates between production planning and control (PPC) system with TPM. Studies that have been carried out only focused on either PPC or TPM. This study therefore looks at the benefits that will be obtained in implementing a good PPC system in a TPM environment. As such, in order to create a more systematic and reliable way of managing the data, programming software need to be created to allow user to gain control over the computer. This will hopefully result in a more convenient, efficient, reliable, lesser error and eventually improves production scheduling.

1.4 Objectives

The aims of this project are:

1. To develop a production planning and control software in a TPM environment for a manufacturing company.

2. To improve the overall production planning and control system from manual recording to computer aided recording.

1.5 Scope of Study

The scope of the study is to develop production planning and control software tailored to the selected manufacturing company known as Earntrade Industries Sdn Bhd. The eight most widely used performance measures namely Master Customer Delivery, Delivery Summary, Daily Delivery Status, Monthly Delivery Status, Master Production Scheduling (MPS), Operation Scheduling, Monthly Capacity Planning and Monthly Delivery Frequency and Cost are included in the study.

CHAPTER 2

LITERATURE REVIEW

2.1 Total Productive Maintenance

Total Productive Maintenance (TPM) is a methodology to form a corporate culture focusing on maximizing the efficiency of the overall production system through cross-functional teaming. It describes a synergistic relationship among all organizational functions, but particularly between production and maintenance, for continuous improvement of product quality, operational efficiency, capacity assurance, safety and enhancement of the people who work within the company. [2]

The three major component of TPM are as follows:

1. Total approach: An all embracing philosophy which deals with all aspects of facilities employed within the area of an operating company and the people who operate, set up and maintain them.

2. Productive action: A very proactive approach to the condition and operation of facilities, aimed at constantly improving productivity and overall business performance.

3. Maintenance: A very practical methodology for maintaining and improving the effectiveness of facilities and the overall integrity of production operation.[3]

Total Productive Maintenance is much more related to the maintenance of the integrity of manufacturing operations and proactive maintenance which concentrates on all aspect of the condition and operation of operating facilities. It

also emphasis in the maximization of equipment effectiveness through total employee involvement. It incorporates the use of autonomous maintenance by operators, small group activities to improve equipment reliability, maintainability and productivity.

The essence of TPM is teamwork, focused on the condition and performance of particular facilities. The team is composed of people who operate, set up and maintain the facilities together with those who are involved in the provision of planning or engineering support to the facilities. TPM program is marked to increase production while at the same time, increase employee morale and job satisfaction.

TPM activities involved all employees, starting from top management till ground floor operators. Besides, it also involves all departments and the participation of all department staff is vital in order to make TPM implementation a success. What makes TPM work is the team and what makes the teamwork is the fact that they are focused on their facilities, their everyday problems and their environment.

Many of the same tools such as total quality management, employee empowerment, benchmarking, documentation, etc are also important to implement and optimize TPM. Nowadays, TPM brings maintenance into focus as a necessary and vitally important part of the business and no longer regarded as non-profit activity.

2.2 Production Planning and Control

Production planning and control (PPC) is concerned with the logistic problems that are encountered in manufacturing, that is managing the details of what and how many products to produce and when, and obtaining the raw material, part and resources to produces those part. PPC solves these logistic problems by managing the information and is a useful tool for top-level coordination of plans for various parts in the company. [4]

Production planning and control software programming was one of the most important elements in TPM activities to enhance production productivity. In today's highly competitive markets, a proper production planning and control means on time delivery, reduce inventory, cut lead time and improve utilization of bottleneck resources. As a result, this simple tool can be used as an important key factor to measure customer satisfaction and evaluate the consistency of the company performance from time to time.

Towards the intermediate or near term horizon, this is a manufacturing authorization plan to produce products at a rate consistent with customer orders, resource availability, marketing plan, financial resource and other part of the overall business.

In this chapter, basic theory of TPM and its co-relationship with production planning and control (PPC) will be discussed and related literature review will be included.

Generally, the fundamental discussion will be based upon the (a) Scope and application of production planning and control within TPM activities, (b) Master Production Scheduling and its development, (c) Characteristic of capacity planning in TPM and (d) Operation scheduling in TPM.

2.3 Origin of TPM

TPM was first introduced in Japan about 20 years ago and has been applied rigorously in many Japanese factories, particularly in the past 10 years. The planning and implementation of TPM in Japanese company have been supported by an influential maintenance institute which each year awards a 'PM' prizes to the best Japanese companies in recognition of their achievement in the application of TPM.

TPM evolved from TQM, which also originate as a direct result of Dr. W. Edwards Deming's influence on Japanese industries shortly after World War II. Beginning as a statistician, Dr. Deming started to use statistical analysis in manufacturing and use the resulting data to control manufacturing. Later on, this initial statistical procedure and the resulting quality concept have transformed Japanese work ethnic into a way of life for Japanese industry. This new concept eventually known as Total Quality Management or so called TQM. [5]

When the plant maintenance problem was examined as a part of TQM program, some of the concept did not seem to work well in the maintenance environment. Preventive maintenance (PM) was practiced that time in most of the plant. However, this technique often resulted in over serviced machines in an attempt to