UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Total Productive Maintenance Implementation in Laboratory

Thesis submitted in accordance with the requirements of the Universiti Teknikal Malaysia Melaka for the Degree of Bachelor of Engineering Manufacturing (Design)

By

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APPROVAL

This thesis submitted to the senate of UTeM and has been accepted as fulfillment of the requirement for the degree of Bachelor of Manufacturing Engineering (Design). The members of the supervisory committee are as follows:

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(Mr. Nor Akramin Bin Mohamad)

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ABSTRACT

For this thesis, the main focus of the final year project is the Tungsten Inert Gas (TIG) welding machines. Total Productive Maintenance (TPM) is a maintenance program which involves a newly defined concept for maintaining plant, equipment and facilities at office or laboratory. Therefore, the TPM is applying to the machines at FKP laboratory such as lathe machine, milling machine, drilling machine and Metal inert gas (MIG) welding machine. The Faculty of Manufacturing Engineering (FKP) machines are just for pilot study before applying the same TPM implementations to the TIG welding machines. For this case study at TIG welding machine, firstly there is one model for the machine that applied the TPM technique. The machine will be checked every month. All problems machines will be mark at the form sheet and the problem solving is identified to plot the Pareto chart. The main problem is mark, so that the maintenance will do to the target part of the machine. Then, the 5S operations are applied to the all machines. After that, the machines that have been maintained will have their counter measure to make it better. So, the inspection for the machines is done for make it success. This TPM implementations are use to increased work efficiency through focused improvement, autonomous maintenance, the so-called ''5S approach''. The global marketplace has become increasingly competitive in recent times and organizations are faced with the challenge of effecting continuous improvement in services for sustained user satisfaction. Therefore the total productive maintenance (TPM) is a new approach to equipment and facility management.

ABSTRAK

Bagi tesis ini, tumpuan utama bagi projek tahun terakhir adalah berkenaan mematerí mesin-mesin. Penyenggaraan produktif yang menyeluruh adalah satu kaedah yang melibatkan sebuah konsep baru dalam proses memelihara kilang, peralatan dan kemudahan-kemudahan di pejabat atau makmal. Oleh itu, ia digunakan sebagai penyelenggaraan untuk mesin-mesin di makmal fakulti kejuruteraan pembuatan (FKP) seperti mesin larik, mesin kisar, mesin gerudi dan mesin kimpalan MIG. Mesin-mesin FKP digunakan sebagai kajian perintis dalam melaksananakan penyelenggaraan ini dan pelaksanaan penyelenggaraan yang sama akan dilakukan pada mesin kimpalan TIG. Untuk kajian kes ini di mesin kimpalan TIG, pertama sekali satu model mesin akan dilakukan penyelenggaraan menyeluruh ini. Mesin tersebut akan diperiksa setiap bulan. Semua masalah bagi mesin-mesin ini akan tanda di dalam lembaran dan penyelesaian masalah akan dikenalpasti bagi mendapatkan carta Pareto. Masalah utama akan dipilih, supaya penyenggaraan yang cukupdapat dijalankan pada bahagian mesin tersebut. Kemudian, operasi-operasi 5S akandilakukan juga ke atas semua mesin itu. Selepas itu, mesin-mesin tersebut akan diukur tahap keberkesanan terhadap penyelenggaraan itu melalui pemeriksaan terhadap kecekapan dan prestasinya. Pelaksanaan penyelenggaraan menyeluruh ini sememangnya digunakan bagi menambah kecekapan kilang melalui pembaikan tertumpu, penyenggaraan bebas, iaitu dipanggil 5S. Pasaran global juga telah mempunyai banyak saingan dan banyak cabaran yang memerlukan pembaikan berterusan terhadap perkhidmatan-perkhidmatan bagi memberi kepuasan kepada pengguna. , Oleh Itu penyenggaraan produktif yang menyeluruh adalah satu pendekatan baru untuk pembaikan peralatan dan pengurusan kemudahan.

DEDICATION

For my parents, Tajudin Bin Bakar and Sabariah Binti Ismail, for my siblings and friends

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Al-Hamdulillah, with the support and guidance I received, my 'Project Sarjana Muda II' thesis project is now complete.

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CHAPTER 1
INTRODUCTION

1.1 Background introduction

According to Albert H.C. Tsang, P.K. Chan,(Mar 2000), total productive maintenance (TPM) is an innovative approach to maintenance which holds the potential for enhancing effectiveness of production facilities. It demands significant change of work culture and radical restructuring of work.

According to Nippondenso, (1960), a Japanese manufacturer of automotive electrical parts the origin of the term "Total Productive Maintenance" is disputed. It was first coined by American manufacturers over forty years ago. Others contribute its origin to a maintenance program used in the late 1960's. It involves a newly defined concept for maintaining plants and equipment. Philosophically, TPM resembles Total Quality Management (TQM) in several aspects, such as total committed to the program by upper level management is required, employees must be empowered to initiate corrective action, and a long range outlook must be accepted as TPM may take a year or more to implement and is an on-going process.

According to Robert S. Jostes and Marilyn M. Helms Total productive maintenance (TPM) describes a synergistic relationship among all organizational functions, but particularly between production and maintenance, for continuous improvement of product quality, operational efficiency, capacity assurance and safety. Total quality management (TQM) is an approach to continuous improvement that involves all levels of an organization. It takes elements such as statistical process

control, self-directed work teams, just-in-time inventory management, and total productive maintenance and fashions them into the overall "total quality" objective.

1.1.1 Benefits of Total Productive Maintenance (TPM) such as:

1) Breakdown losses result in equipment downtime for repairs and are unexpected. Associated costs include downtime, labor and spare parts.
2) Set-up and adjustment losses occur during product changeovers, shift change or other changes in operating conditions. Ramp-up efficiency losses would be included in this category.
3) Minor stoppage losses are typically from zero to 10 minutes in length and include machine jams and other brief stoppages that are difficult to record manually. As a result, these losses are usually hidden from efficiency reports and are built into machine capabilities. When combined, they can represent substantial equipment downtime.
4) Speed losses occur when equipment must be slowed down to prevent quality defects or minor stoppages. In most cases, this loss is not recorded because the equipment continues to operate, albeit at a lower speed. Speed losses obviously have a negative effect on productivity and asset utilization.
5) Quality defect losses are caused by the manufacture of defective or sub-standard products, which must be reworked or scrapped. These losses include the labor and material costs (if scrapped) associated with the off-specification production.
6) Yield losses reflect the wasted raw materials associated with the quantity of rejects and scrap that result from start-ups, changeovers, equipment limitations, poor product design, etc. It excludes the category 5 defect losses that result during normal production.

1.1.2 Types of Total Productive Maintenance (TPM):

There are 4 types of Total Productive Maintenance (TPM) implementations such as:

1) Preventive Maintenance
2) Corrective Maintenance
3) Prevention Maintenance
4) Break – down Maintenance

1.2 Problem statement

There is no good schedule for machine maintenance and sometimes there are more machines in progress at the same time. Besides that, the maintainers also do not have skill to repair and maintain the machine and do know when must put oil at the machine. These problems are happened in Faculty of Manufacturing Engineering (FKP) laboratory.

1.3 Objectives

The objectives of this project such are:

1) To understand and study about Total Productive Maintenance (TPM).
2) To identify and analyze the issue of TPM at laboratory.
3) Improving equipment effectiveness
4) Improving maintenance of machines performance.

1.4 Scopes of the Research

The scopes of this project are such as:

1) Applying the TPM principles of TIG welding machine in FKP laboratory.
2) Analyzing the effectiveness of the TPM.
3) This research is done at FKP laboratory.

CHAPTER 2
LITERATURE REVIEW

2.1 Introduction

The literature review discuss about the improvement in manufacturing through Total Productive Maintenance (TPM) principles. Improvement the machines such as lathe, milling, drilling and welding by study how to repair the machine, analyze the machine problem and make a planning of problem solving are the main sources of causing the performance of the machine and the maintenance in manufacturing process. By the analysis and observation during apply the TPM principles to the all machines, we can see the systems at the laboratory are more practical because the each machine is maintain by their own technicians and the staff. This TPM is also can reduce the failed until zero and can maximize the performance maintenance besides minimize the cost of tooling maintenance in laboratory.

2.2 Total productive maintenance

According to Moubray, 1991, Total Productive Maintenance (TPM) is a maintenance program which involves a newly defined concept for maintaining plants and equipment. The goal of the TPM program is to markedly increase production while, at the same time, increasing employee morale and job satisfaction. The TPM program closely resembles the popular Total Quality Management (TQM) program. Many of the

same tools such as employee empowerment, benchmarking, documentation, etc. are used to implement and optimize TPM. Total Productive Maintenance (TPM) (Moubray, 1991) is a Maintenance program concept. Philosophically, TPM resembles Total Quality Management (TQM) in several aspects, such as Total commitment to the program by upper level management is required, employees must be empowered to initiate corrective action, and a long range outlook must be accepted as TPM may take a year or more to implement and is an on-going process. Changes in employee mind-set toward their job responsibilities must take place as well. The origin of the term "Total Productive Maintenance" is disputed. Some say that it was first coined by American manufacturers over forty years ago. Others contribute its origin to a Maintenance program used in the late 1960's by Nippondenso, a Japanese manufacturer of automotive electrical parts. Seiichi Nakajima, an officer with the Institute of Plant Maintenance in Japan is credited with defining the concepts of TPM and seeing it implemented in hundreds of plants in Japan.

Aacording to Maggard and Rhyne, 1992 Total Productive Maintenance is not the same as a maintenance department that repairs breakdowns (breakdown maintenance). TPM is a critical adjunct to lean manufacturing. If machine uptime is not predictable and if process capability is not sustained, we cannot produce at the velocity of sales. One way to think of TPM is “deterioration prevention”, not fixing machines. For this reason many people refer to TPM as "Total Productive Manufacturing" or "Total Process Management". TPM is a proactive approach that essentially aims to prevent any kind of slack before occurrence. Its motto is "zero error, zero work-related accident, and zero loss." Think of productive equipment as we think of our cars or telephones: they are ready to go when we need them, but they need not run all the time to be productive. For this concept to function properly, the machines must be ready when we need them and they must be shut down in such a fashion as to be ready the next time. Key measures include efficiency while running and quality. Overall Equipment Effectiveness (OEE) tells us how TPM is working, not just the typical measures of uptime and throughput. TPM is a close companion of 5S and uses elements of the visual workplace. Operators know what maintenance tasks are theirs; they also know what tasks are appropriate for the skilled trades maintenance crew. TPM is an empowering philosophy that helps create