TOTAL PRODUCTIVE MAINTENANCE IN MANUFACTURING INDUSTRY IN MALAYSIA

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Specially dedicated to my beloved parents, siblings
and always cherished friends

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ABSTRACT

Large number of framework of Total Productive Maintenance (TPM) elements/strategies have been proposed by different authors in TPM literature. However, most of them are based on studies done in countries such as Japan, Italy, USA, China and India. Thus, this study aims to evaluate TPM elements/strategies emphasis and their contribution towards manufacturing performance in electrical and electronic industry in Malaysia. A survey methodology is used where questionnaires are sent to 240 companies in electrical and electronic industry in Malaysia with the resulting response rate of 12.5 % which is comparable with other studies. The TPM element most emphasized on in Malaysian electrical and electronic industry is planned maintenance management while the least emphasized element is on top management leadership. Using statistical tools, the correlation between TPM elements emphasis and manufacturing performance dimension has been calculated. The study reveals that the TPM elements – top management leadership, planned maintenance management, focused improvement, autonomous maintenance and education and training have significant contribution towards manufacturing performance such as lower cost, higher quality, strong delivery and increased productivity. The five TPM elements could be used as a guideline for companies wanting to implement TPM as well as evidence to convince management of the importance of TPM towards the organization. Besides that, there are also no significant differences found of TPM element practices between electrical and electronic industry while only some elements are significant when comparing small and medium industry (SME) and large companies. In addition, the longer the TPM implementation time period, the more improvements are seen in manufacturing performance.

ABSTRAK

Terdapat banyak panduan tentang elemen atau strategi *Total Productive Maintenance* (TPM) yang telah dicadangkan oleh penulis berlainan dalam bidang literatur TPM. Namun begitu, kebanyakannya adalah hasil kajian yang dijalankan di negara- negara seperti Jepun, Itali, USA, China dan India. Oleh sebab itu, kajian ini bertujuan untuk mengkaji elemen atau strategi TPM dan sumbangan mereka terhadap prestasi syarikat pembuatan Malaysia dalam bidang elektrik and elektronik. Soal selidik digunakan sebagai methodologi kajian ini and ia dihantar kepada sejumlah 240 syarikat dalam bidang elektrik and elektronik di Malaysia. Kadar sambutan adalah 12.5 % yang setaraf dengan kadar sambutan kajian lain. Elemen TPM yang paling banyak diamalkan oleh syarikat di Malaysia ialah *planned maintenance management* dan yang paling kurang diberi tumpuan ialah *top management leadership*. Hubungan di antara elemen TPM dengan pencapaian sesebuah organisasi dikaji dengan mengunakan kaedah statistik. Kajian mendapati bahawa elemen TPM seperti *top management leadership, planned maintenance management, focused improvement, autonomous maintenance* dan *education and training* telah menyumbang secara kritikal terhadap pencapaian sesebuah organisasi terutama dalam menurunkan kos, qualiti yang tinggi, penghantaran produk yang cepat dan tepat, dan peningkatan produktiviti. Lima elemen TPM tersebut boleh digunakan sebagai panduan kepada syarikat yang ingin mengamalkan TPM dan juga sebagai bukti kepada pihak atasan tentang sumbangan TPM kepada syarikat tersebut. Selain itu, tidak ada perbezaan dari segi elemen TPM yang diamalkan di antara industri elektrik dan elektronik dan hanya sesetengah elemen yang berbeza apabila dibandingkan antara industri kecil dan sederhana dengan industri yang besar. Tambahan pula, lebih lama TPM diamalkan, lebih jelas peningkatan dalam pencapaian syarikat tersebut.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

In today's competitive and mature economic environment, many manufacturing plants worldwide faces many challenges to achieve world-class manufacturing standards in operations. In addition, market forces are demanding more emphasis on customization, quick delivery and superb quality (Raouf and Ben-Daya, 1995). Thus, the competitive power of a typical manufacturing company increasingly depends on the speeds of obtaining market information and of creating advanced production engineering to develop new attractive products and to establish an appropriate production process, the production lead times and the speed of distribution. These pressures demand excellent maintenance practices in such a way that machines and processes are available whenever needed and able to produce the desired products with the required quality level (Yamashita, 1994). Reliable equipment, operating at the lowest possible cost is also an essential enabler of profits (Williamson, 2006). Modern manufacturing has to possess both efficient and effective maintenance in to order to be successful. One approach to improve the performance of maintenance activities is to implement a total productive maintenance (TPM) system. In fact, the only proven work culture that promotes and sustains reliable equipment at lower costs is through Total Productive Maintenance (Williamson, 2006). TPM is also considered to be an effective strategic improvement initiative for improving quality in maintenance engineering activities (Ollila and Malmipuro, 1999).

The successful implementation of TPM in a manufacturing enterprise depends on approach or strategies that management use during the implementation stage. A well drawn TPM implementation plan not only improves equipment efficiency and effectiveness but also brings appreciable improvement in other areas such as reduction of manufacturing cycle time, size of inventory, customer complaints and creates cohesive small group autonomous teams and increase the skill and confidence of the individual (Shamsuddin *et al*., 2005).

Implementing TPM is a strategic decision that the management has to make which can be assisted by utilizing a form of framework. A framework can act as a guide and provides a structured approach to achieve certain objectives (Mishra *et al*., 2008).

1.2 Problem Statement

There are a large number of frameworks which has been proposed by authors and consultants in the literature of Total Productive Maintenance (TPM). However, most of them are based on studies done in countries such as Japan, Italy, USA, China and India. TPM methods and techniques were first successfully implemented in Japan and later followed and adapted in other countries of the world. For example, Bamber *et al*. (1999) has discussed about the factors affecting successful TPM implementation and describe the same using a case study of a medium-scale manufacturing industry in the UK. In India, the use of complimentary and proven strategies of TPM has contributed towards achieving core competence of the organization in a competitive environment (Ahuja *et al*., 2004). Tsang and Chan (2000) had studied the implementation of TPM in China through a case study approach. Ireland and Dale (2001) also discussed about TPM implementation in three industries – a rubber product industry, a packaging company and a motorized vehicle manufacturer.

Despite following a structured approach in developing the framework, each country has their own emphasis on TPM elements or strategies. In other words, the environmental-country factor explains a significant portion of variation in TPM implementation. For example, Kathleen *et al*. (1999) had found that the three countries that were surveyed, Japan, USA and India have different emphasis on TPM implementation. Italy placed less priority on autonomous maintenance and cross training compared to the USA and Japan. On the other hand, Japan has similar emphasis on housekeeping and training with USA but has a higher level of operator involvement and discipline planning compare to the USA. These country differences could be because of cultural differences that support or hinder TPM implementation and other measures that differ from country to country.

Due to the lack of comprehensive studies on TPM strategies or elements in Malaysia, this study aims to find a suitable operational strategy or TPM elements emphasis for the Malaysian manufacturing industry specifically in the electrical and electronic industry. Besides that, analysis will be done to see the effect of these TPM initiatives towards the core competencies or benefits to the manufacturing organization. There is limited information available regarding the contributions of TPM strategies in Malaysia. The ones done such as Shamsuddin *et al*. (2004) and One *et al*. (2006) are more of a case study implementation and shows only the extent of TPM implementation in the respective industries. Besides that, difference of TPM strategies or elements practices between electrical and electronic industry, as well as between small medium industry (SME) and large companies will also be explored. The effect of TPM implementation time period on manufacturing performance will also be covered as well.

1.3 Objective

The objective of this study is to evaluate the TPM elements or strategies emphasis in manufacturing industry specifically electrical and electronic industries in Malaysia and their contribution towards manufacturing performance.

1.4 Scope

1. Intensive literature review will be done on existing TPM strategies frameworks and questionnaires built based on it.
2. Random sampling conducted on the electrical and electronic industries in Malaysia.
3. Using statistical tools to find correlation of respective TPM elements/ strategies emphasis towards different aspects of company performance.
4. Test of significance will be performed to study differences of TPM elements practices between electrical and electronic industry as well as between SMEs and large companies.
5. Effect of TPM implementation time period on manufacturing performance will also be covered.