

# Total Productive Maintenance Strategy in a Semiconductor Manufacturer: A Case Study

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**Abstract** – The role of maintenance in manufacturing has become more crucial and important in today's competitive environment. It is estimated that maintenance cost contributed approximately 10-30 percent of total operation cost. In order to stay competitive, manufacturing companies are forced to introduce production improvement programs to increase both quality and productivity. Total productive maintenance (TPM) is a well-known and very useful methodology which allows manufacturing firms to attain near ideal conditions with zero downtime, zero defects and zero accident. The objective of this paper is to study the effectiveness of TPM implementation in a multinational semiconductor manufacturer. In this study a bottleneck process from the production line was chosen and continuous improvements were implemented to improve equipment effectiveness. The results achieved are very encouraging in the reduction of equipment downtime, improvement in overall equipment effectiveness, employee motivation and reduction in number of accident rate at the shop-floor.

**Keywords** – Total productive maintenance, Semiconductor industry, OEE, Kobetsu Kaizan

## I. INTRODUCTION

The increase of operations and maintenance costs from year to year are of great concerns for most manufacturing firm today [1]. In an effort to optimize production and reduce costs, these manufacturers have implemented TPM programs. TPM programs are essential to increase equipment availability and hence reduce the need for further investments [2]. TPM is an aggressive production program to improve overall equipment effectiveness by reducing machine downtime [3]. In today's competitive environment, manufacturing firm's success is very much dependent on its capability to incorporate cost reduction and productivity improvement in its operations[4]. Productivity can be expressed as physical measurement of the rate at which outputs of goods or services are produced per unit of input [4]. If a manufacturing company is able to produce the desired output with a given input, then higher productivity efficiency is achieved [4].

## II. LITERATURE REVIEW

TPM approach focuses upon the entire organization for the systematic elimination and identification of equipment scheduled and unscheduled downtime [1, 5]. It is a world class manufacturing methodology that has been adopted by many manufacturing firm to improve operation and maintenance cost [6]. Overall equipment effectiveness (OEE) is used to measure the effectiveness of the TPM implementation. The case study done by William et al [6], demonstrated an improvement in Overall Equipment Effectiveness after the implementing TPM in a company.

According to the father of TPM Nakajima [7], the concept is widely used to improve equipment utilization by reducing six big production losses. The implementation process is based on the TPM eight pillars suggested by Japan Institute of Plant Maintenance (JIPM). Some TPM implementers will implement all eight pillars, and some of the practitioners only adopted a few pillars depending on the company's needs and capabilities [7].

Manu Dogra, Visha S. Sharma, Anish Sachdeva and Dureja [2] revealed that TPM is able to enhance overall organization profitability growth by changing the employee mindset in involving and leading to continues improvement in the organization. Furthermore, it has been proven that TPM is a positive strategic and maintenance program that works perfectly with Total Quality Management (TQM) and lean manufacturing in develop both the company and its employees individually [2]. With the acceptance 'changed' mindset embrace within the whole organization, it will be increase the successful rate of TPM implementation in the organization [8].

Based on the case study carried out by Chan *et al.* [9], there was about 83% improvement in equipment productivity improvement after TPM implementation. The number of equipment stoppages has improved from 517 to 89 times. It also demonstrated a tremendous improvement in product quality produced [9]. Beside of this, after the TPM implementation, it had improved the shop floor technical skill and promote a good cross functional team work culture and created a high performance workforce to enhance organization in both competitive power and total image [1, 9].

The tangible contribution of TPM to production performance includes increasing in overall equipment effectiveness [1, 10]. Equipment effectiveness is a measure of the value added to production through the equipment used. The number of mean units between assists increases tremendously after TPM implementation







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