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STATEMENT OF THE PROBLEM

OBJECTIVES

HYPOTHESES

RESEARCH METHODOLOGY

RESULTS & DISCUSSION

FINDINGS

RECOMMENDATIONS/SUGGESTIONS

CONCLUSIONS

SCOPE FOR FURTHER RESEARCH

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APPENDIX/ANNEXURE

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RELEVANCE OF TPM IN INDIAN INDUSTRIES: LITERATURE REVIEW

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ABSTRACT

Total Productive Maintenance (TPM) has attracted the attention of industries all over the world. The perceptible impact of TPM lies in attaining the far reaching productivity and quality standards. Indian industries are looking for innovative approaches like TPM, TQM, and JIT etc. in order to become competitive and survive in the global market. The intent of this research is to review the literature on TPM and to study its relevance in Indian Industries.

KEYWORDS
Attributes, competitive, implementation.

INTRODUCTION

Business conditions are changing rapidly and continuously. Markets are affected by diverse customer needs, which demand higher quality, shorter delivery time, higher customer service level and lower prices. At the same time, product life cycles are becoming shorter and shorter. Success in any competitive context depends on having either a cost advantage or a value advantage, or, ideally both. The survival of any business depends on its ability to compete effectively. Therefore, the manufacturing company structure has changed from a labor-intensive industry to a technology-intensive, i.e. capital intensive, industry. Many changes in the internal environment of the companies are taking place increased use of mechanization and automation of operations such as total productive maintenance (TPM), flexible manufacturing systems (FMS), robots, automatic warehousing, automatic guided vehicles (AGVs); increased trends of using just-in-time (JIT).Industrialists have realized the need to improve quality of products & services to compete successfully in the world market. Manufacturing organizations striving for world-class performance wants to improve productivity by utilizing the available resources. Full utilization of resources requires better machine output, better employee output, and better services.

The concept of T P M, which aims at maximizing the equipment effectiveness, originated from Japan. It made progressive strides in countries like USA, Europe and other south Asian countries after its successful implementation in Japan. Total productive maintenance (T P M) is the process of maximizing equipment performance, availability, and quality with the total involvement of the production operators, technicians, engineers, supervisors and managers. In this global environment, Indian industries have to improve in order to compete and survive. This paper attempts to review papers in the area of TPM and based on this identify research directions in Indian context.

MOTIVATION

Today, manufacturers have realized that for staying for long time in international market, they have not to be concentrate on company profit only but product quality, zero defect, safety, overall equipment effectiveness are the other criteria which needs a strong attention. TPM is a management approach which improves the organization internally i.e. productivity aspect, as well as externally i.e. market value aspect. Customers expectation have increased as the globalization has born competitiveness now the key of customer satisfaction is high product quality, low product price, more options. Fortunately these keys are requirements belong to target of TPM. As the TPM program is not a matter of days or months it may take even two or more year. During this time period it's more important to work over the factors on priority basis to get successful implementation of TPM. As the study of change in frequency of failure must be started only after implementation of TPM pillars, otherwise result of early studies may decline the moral of employee's. For staying in competitive market an organization must have continuous improvement throughout the organization with innovative plan .TPM is the right approach for continuous improvement with innovative tools like automation, vibration based and other. Therefore it has been chosen as a research area for TPM implementation in Industrial Scenario.

LITERATURE REVIEW

In the literature, TPM has continuously drawn attention from researchers and practitioners. TPM is a method for bringing about change. It is a set of standard activities that can lead to improved management of plant assets when properly performed by individuals and teams. Total productive maintenance (TPM), as defined by Nakajima, 1984 [15] is productive maintenance carried out by all employees through small group activities and can be viewed as equipment maintenance performed on a company-wide basis.

The original approach to implementing TPM was described by Nakajima, 1984 [15] with reference to the fabrication and assembly industries. Now TPM is Extending, all over the world, to encompass also process industry, an example of an implementation programme of TPM for this type of manufacturer is that which has been carried out by Suzuki

In an effort to increase organizational capabilities, companies have made investments in programs such as just-in-time (JIT) and total quality management (TQM). However, benefits from these programs have often been limited because of unreliable or inflexible equipment. Therefore, many companies, including Procter and Gamble, Dupont, Ford and Eastman Chemical, have looked toward total productive maintenance (TPM) to augment their JIT and TQM programs in a drive for continual improvement. TPM addresses equipment maintenance through a comprehensive productive-maintenance delivery system covering the entire life of the equipment and involving all employees from production and maintenance personnel to top management.

While research that considers the mathematical modeling and statistical research base of equipment maintenance has been extensive, little research has directly investigated TPM maintenance activities. Refer to Wiremen, 1991 [11] for reviews of the maintenance and reliability literature. These papers focus on modeling the reliability of equipment and on developing policies to inspect, repair, or replace equipment based on its specific reliability characteristics. We are interested in academic research that goes beyond these traditional modeling approaches and adequately supports the implementation of TPM activities, practices, and management systems.

Christian N. Madu 1994 [3] has stated that total productivity maintenance (TPM) is a maintenance productivity improvement practice analogous to the use of total quality management (TQM). TPM involves the participation of employees from cross-functional departments to achieve continuous improvement in terms

of product quality, operation efficiency, production capacity, and safety. This is achieved through total equipment effectiveness and total maintenance delivery. Maintenance operations are increasingly popular as a means of improving equipment reliability, availability, and effectiveness. For example, estimates that 10.40% of production costs are due to direct maintenance expenditures. Thus, maintenance costs must be considered and strategies formalized to minimize them.

McCone and Weiss, in 1995 identify significant gaps between industry practice and academic research and emphasize the need to bridge these gaps by providing guidelines for implementing TPM activities. TPM is designed to maximize equipment effectiveness improving overall efficiency by establishing a comprehensive productive-maintenance system covering the entire life of the equipment, spanning all equipment-related fields planning, use, maintenance, etc. and, with the participation of all employees from top management down to shop-floor workers, to promote productive maintenance through motivation management or voluntary small-group activities.

The continuous improvement concepts such as total quality management, just-in-time and total productive maintenance have been widely recognized as a strategic weapon and successfully implemented in many organizations. In this paper, we focus on the application of total productive maintenance (TPM). A random non-linear regression model called the time constant model was used to formulate a prediction model for the learning rate in terms of company size, sales, ISO 9000 certification and TPM award year. A two-stage analysis was employed to estimate the parameters. Using the approach of this study, one can determine the appropriate time for checking the performance of implementing total productive maintenance. By comparing the expected overall equipment effectiveness (OEE), one can improve the maintenance policy and monitor the progress of OEE.

Laura Swanson, 1997 [13] stated that in an increasingly competitive environment, manufacturing firms have continued to implement new technologies aimed at improving plant performance. These new technologies are often more complex to maintain. At the same time, equipment breakdowns can become more costly and disruptive. However, managers tend to give little consideration to how different production technologies may affect the maintenance function. This paper reports the results of a study of the relationship between the characteristics of production technology and maintenance practices. Based on the responses from a survey of plant managers and maintenance managers, the analysis shows a strong relationship between technical complexity and maintenance practices that increase the technical expertise of the maintenance workforce.

G. Chand, 2000 [5] stated "total productive maintenance is a Japanese concept of equipment management that allows a facility to improve decisively the equipment performance in the manufacturing area with the help and involvement of all employees". A fundamental component of world-class manufacturing (WCM) is that of total productive maintenance (TPM), linked to both total quality management (TQM) and the concepts of continuous-flow manufacturing which are embedded in cellular manufacturing An investigation was conducted in collaboration with a first tier automotive component supplier to determine the overall equipment effectiveness (OEE) of a semi-automated assembly cell. The big losses associated with equipment effectiveness were also identified. This represents 97% good components, 0.33% scrap and 2.67% rework. The number of stoppages recorded was 156, where the 10 most common causes were identified. The OEE was 62% and the six big losses represent 38% loss of the productive time. Based on the findings, it was recommended that a pilot project to be conducted to implement a TPM programme for the cell and expand it further to the other cells in the factory.

Geert Waeyenbergh, 2004 [6 stated that TPM activities focus on eliminating the six major losses. These losses include equipment failure, set-up and adjustment time, idling and minor stoppages, reduced speed, defects in process and reduced yield. A company contains a large number of technical systems which all interact to achieve the pursued business objectives. Maintenance contributes more than ever to the achievement of these objectives. Indeed, proper maintenance does not only help to keep the life cycle cost down; it also contributes positively to the overall performance of the company. However, maintenance also contributes significantly to the total cost, and this often forms the basis of performance improvement demands to the maintenance department. A maintenance concept can be defined as the set of various maintenance interventions (corrective, preventive, condition based, etc.) and the general structure in which these interventions are foreseen. The maintenance concept forms the framework from which installation-specific maintenance policies are developed and is the embodiment of the way a company thinks about the role of maintenance as an operations function. As a consequence, it influences every part of the maintenance activities in the company.

This thesis shows how their models could be modified by applying analytic hierarchy process (AHP) to consider total productivity maintenance. Through this application, it is shown that "optimal" solutions with lower costs are obtained. These results are, therefore, improvement over the models presented by other researchers. Total productive maintenance (TPM) is the systematic execution of maintenance by all employees through small group activities.

The dual goals of TPM are zero breakdowns and zero defects; this obviously improves equipment efficiency rates and reduces costs. It also minimizes inventory costs associated with spare parts. It is claimed that most companies can realize a 15-25 percent increase in equipment operation rates within three years of adopting TPM. Labour productivity also generally increases by a significant margin, sometimes as high as 40-50 percent.

The Japanese imported preventive maintenance (PM) from the United States in the 1950s and it remained well established until the 1970s. This consisted mainly of time-based maintenance featuring periodic servicing and overhaul. During the 1980s PM was steadily replaced by predictive maintenance, or condition-based maintenance (see reliability-centered maintenance). TPM is often defined as productive maintenance involving total participation - a kind of marriage between PM and TQM. Many organizations misconstrue this to imply that only shop floor staff needs be involved. However, TPM should be implemented on a company-wide basis.

C.D.O'Donoghue, 2004 [4] stated equipment, be it sophisticated or basic in operation and design, depending on its usage, will inevitably malfunction and breakdown. Within any organization where manufacture is the primary activity, it is crucial that procedures exist for equipment maintenance. Not only does equipment maintenance need to be planned for, the possibility and probability of breakdowns and disruption to operations must also be considered when planning and scheduling production. This paper examines the basis of various maintenance management strategies used to date in international manufacturing. These strategies assist the maintenance function and enable the process of maintenance to be optimized. Special attention is given to computerized maintenance management systems (CMMSs), how this particular strategy was successfully implemented in a medium sized Irish textile manufacturing company.

Mark C. Eti, 2006 [14] have told that a developing society needs to adapt to change and foster creativity. In the pursuit of continual improvement (e.g., reducing fossil-fuel consumption and waste, better service performance, greater availability and improved reliability), implementing wise maintenance schedules is essential for contemporary organizations. Several studies of a wide range of Nigerian industries indicate that indigenous low availability and low productivity are endemic. The resulting closure of some of these industries has triggered off a realization of the strategic challenges in maintenance management. In addition, the increasingly-competitive business environment in Nigeria has raised the strategic importance of maintenance functions, especially in organizations with significant investments in physical assets. Five strategic aspects of maintenance management have been identified, namely: maintenance methodology; support processes; organization and work structuring; comparable culture; and general management policy.

Abhijit Gosavi, 2006 [1] has told that total productive maintenance (TPM) is a management initiative that has been widely embraced in the industry. A positive strategic outcome of such implementations is the reduced occurrence of unexpected machine breakdowns that disrupt production and lead to losses which can exceed millions of dollars annually. Additionally, frequent machine breakdowns indirectly can lead to a host of other problems, e.g., difficulties in meeting customer deadlines, which makes the transition from make-to stock to make-to-order difficult and magnifies the need to keep extra safety stocks, increasing inventory-holding costs. An important tool of a TPM program is the stochastic model used to determine the optimal time for preventive maintenance (PM). PM can help reduce the frequency of unexpected repairs when the failure rate is of an increasing nature.

Macarmen Corners, 2006 [8] told that predictive maintenance can provide an increase in safety, quality and availability in industrial plants. However, the setting up of a predictive maintenance programme is a strategic decision that until now has lacked analysis of questions related to its setting up, management and control. An evaluation system is proposed that carries out the decision making in relation to the feasibility of the setting up. The evaluation system uses a combination of tools belonging to operational research such as: analytic hierarchy process, decision rules and Bayesian tools. This system is help tools available to the managers of predictive maintenance programmes which can both increase the number of predictive maintenance programmes set up and avoid the failure of these programmes.

A.K.M. Masada, 2007 [2] has told that TPM brings maintenance into focus as a necessary and vitally important part of the business. Downtime for maintenance is scheduled as a part of the manufacturing day and, in some cases, as an integral part of the manufacturing process. The goal is to hold emergency and unscheduled maintenance to a minimum.

J Venkatesh, 2007 [10] stated that TPM is a new approach to equipment and facility management. TPM is a maintenance program, which involves a newly defined concept for maintaining plant, equipment and facilities.

- Total: signifies involvement of all functions and people at all levels of hierarchies.
- Productive: emphasizes efficient and effective utilization of all resources.
- Maintenance: means keeping man-machine-material systems in optimal condition.

Imad Alsyouf, 2007 [7] illustrates how an effective maintenance policy could influence the productivity and profitability of a manufacturing process. It was possible to show how changes in the productivity affect profit, separately from the effects of changes in the uncontrollable factors, i.e. price recovery. The main results of the case study performed at a Swedish paper mill showed that a paper-mill machine could, ideally, generate extra profit of at least 7.8 million Swedish kronor (SEK) (approximately US$ 0.975 million) per year, i.e. 12.5% of its yearly maintenance budget, if it avoids all unplanned stoppages and bad quality production due to maintenance-related causes. Thus, maintenance is not a cost centre, but a profit generating function.

Kamran et al. 2009 [12] states through system dynamics concepts, effects of implementation of TPM on machine reliability, process quality and net throughput has been analyzed. Results obtained show the effectiveness and usefulness of TPM in reducing breakdown maintenance (BM) tasks as well as enhancing machine reliability, process quality and product's throughput.

According to Jorge L.Perez-Lafont, 1997 [9], total productive maintenance (TPM) is the process of maximizing equipment performance, availability, and quality with the total involvement of the production operators, technicians, engineers, supervisors and managers.

CONCLUDING OBSERVATIONS AND DIRECTIONS FOR FUTURE RESEARCH

It has been observed from the literature review that more empirical studies are needed in Indian context to test rigorously the conjecturer around total productive maintenance. The following gaps are identified from the literature review:

1. There is no focus to implement TPM in small scale industries in Indian industrial scenario.
2. There are few studies till date that have been devoted to analysis of total productive maintenance adopted by Indian manufacturing companies.
3. There are many qualitative studies reported on total productive maintenance for different sector companies i.e. process industries, mechanical industries etc. But, there are few studies those have focus on electronics manufacturing industries and service sector.

Keeping in the view of the above insights, there is real need to study implementation of total productive maintenance in cross- sector Indian scenario. The present work attempts to study the various implementation techniques of total productive maintenance in response to the emerging globalized and competitive environment in Indian context.

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