



Implementation of Total Productive Maintenance in Industry

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ABSTRACT

The importance of TPM (Total Productive Maintenance), which stands for Total Productive Maintenance, for the modernization of the global economy, has resulted in strong globalization, and the optimization of resources and costs in all forms is required to ensure market sustainability for any product or service. The global competition is focused on the development of advanced materials, systems, and other technologies, and technological support is a must for any progress in product or process. The principle of Total Efficient Maintenance, which focuses on improving equipment availability, efficiency, and quality while still ensuring employee health and safety and environmental security, is very relevant today. TPM demonstrates how to reach world-class standards of total equipment effectiveness by focusing on humans rather than hardware or processes. It covers the organizational processes, individual relationships, analytical methods, and performance criteria associated with Total Productive Manufacturing programme execution.

Keywords: *Total productive maintenance, Productivity improvement, Continuous improvement, Preventive Maintenance and reliability.*

1. INTRODUCTION

Huge losses/wastage arise on the production shop floor in today's industrial environment. This waste is caused by operators, support personnel, processes, tooling issues, and the inability to obtain parts on time, among other things. Idle machinery, idle workers, broken machines, rejected components, and other sources of waste are all types of waste. Quality-related waste is notable because it affects the company in terms of time, material, and the company's hard-earned image. Other intangible wastes include running equipment at lower than rated speeds, lost start-up time, system breakdowns, and process bottlenecks. In the manufacturing and assembly industry, zero-oriented concepts such as zero tolerance for pollution, faults, breakdowns, and collisions are becoming a requirement. In this case, many companies around the world have adopted the innovative concept of Total Productive Maintenance (TPM) to solve the ongoing challenge. Any TPM initiative aims to boost efficiency and production while also improving staff happiness and work satisfaction. Preventive maintenance was once thought to be a non-value-adding operation, but it is now a necessity for a longer system life cycle in an industry. TPM is a transformative approach to maintenance that optimizes equipment effectiveness, prevents breakdowns, and encourages autonomous operator maintenance by including the entire staff in daily operations.

2. RELATED WORK

Nakajima S. [1] done pioneering work and has given basic definition of TPM, its importance, goals of TPM, objectives of TPM, merits and demerits of TPM and steps to be followed while implementing TPM. Also author has described about challenging limits for TPM, method for calculation of OEE, possible areas of wastage of resources which may occur.

Ahuja I P S [2] gives in-depth review on TPM literature published. Author has summarized eight pillars for the success of TPM implementation as shown in Fig. 1.

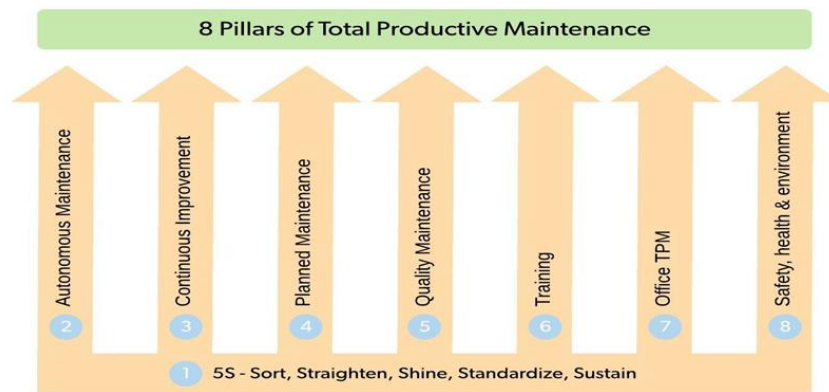


Fig 1. Pillars of TPM

3. TPM IMPLEMENTATION

TPM is concerned with improving planning and preparation. Other factors that influence efficiency include availability, output, and yield. Breakdowns and change-over, i.e. where the line is not going when it should be, result in availability losses. Small stops, idling, or vacant spaces cause performance losses. The line could be working in this situation, but it is not supplying the desired amount. Rejects and bad start-up activity in the line delivering the goods are examples of yield losses. These losses result in low overall machinery effectiveness (OEE) values, which indicate how efficient the manufacturing process is. TPM contributes to increasing the OEE's valuation by providing an approach for evaluating these losses. The use of TPM results in both short- and long-term benefits.

Stages of TPM Implementation

Stage A-Preparatory stage;

Step 1- Management's announcement to all employees on the implementation of TPM in the organization: This process requires proper understanding, dedication, and constructive participation from top management. Senior management should participate in awareness programs before making an announcement. The decision to introduce TPM is announced in the company journal, posted on notice boards, and a letter advising vendors and consumers is sent out.

Step 2- TPM initial education and propaganda: Training will be provided as required. Others need further preparation, and others only require training sessions depending on the skills of maintenance workers.

Step 3- Creating TPM and departmental committees: TPM involves such things as improvement, autonomous maintenance, and quality maintenance, among other things. When committees are formed, they can address all of these issues.

Step 4- Setting up the TPM working structure and goals: Each area/work station is benchmarked, and goals are set for success.

Step 5- An institutionalization master plan: The next step is adoption, which leads to institutionalization, where TPM becomes a corporate culture. Obtaining the PM award demonstrates that you have reached a reasonable standard.

Stage B-Introduction stage:

A small gathering is held with the participation of our vendors and customers. Suppliers should be aware that we need high-quality supplies from them. People from associated and associated firms who may be our clients, sisters concerns, and so on are also welcome. Others will be able to benefit from us, and others will be able to assist us, and our consumers may get the message that we are concerned with quality reliability, expense, and meeting delivery deadlines.



Stage C-Implementation of TPM:

In this point, eight activities are carried out, which are referred to as the "eight pillars" of TPM activity growth. These four practices are for developing a framework for improving manufacturing quality, one for establishing an original management system for new goods and facilities, one for improving administrative efficiency, and one for controlling safety and sanitation in the workplace.

Stage D-Stage of institutionalization

TPM implementation practices should have entered a mature stage by now. Now is the time to submit an application for a preventive maintenance award.

4. STEPS FOR IMPLEMENTING TPM

The TPM principle is being introduced in at a machine shop for a corporation that makes automotive parts. One TPM pillar is introduced in each process. The performance of TPM deployment is measured by overall equipment efficacy (OEE).

5S is the starting point for TPM. 5S may be placed at the heart of TPM implementation. It's a Japanese way of doing things in the building. If the workplace is disorganized, problems can go unnoticed. Cleaning and organizing the office assists us in identifying and resolving issues. Making things apparent and visible to the public allows for change. If 5S is not taken seriously, it would result in 5D, which stands for Delays, Defects, Dissatisfied Consumers, Declining Earnings, and Demoralized Workers.

The 5S phases

Sorting, straightening, systematic cleaning, standardizing, and sustaining are the five main processes of 5S. Additionally, there is a protection step that is sometimes used.

Sorting (Seiri): Recognize the difference between what is essential and what is not, and discard the latter. Work-in-progress; unnecessary tools; unused machinery; faulty products; papers and paperwork are all things that can be eliminated. Examine all equipment, supplies, and other items in the plant and work environment. Just keep what you absolutely need. Anything that is either saved or thrown out.

Setting in Order (Seiton): All should have a place and everything should be in its place. Each item's location should be clearly labelled or defined. Items can be organized in such a way that allows for a smooth flow of work. Workers should not be required to bend repeatedly to gain access to supplies. Any instrument, component, supply, piece of equipment, and so on should be held close to its intended usage (i.e. straighten the flow path). One of the characteristics that separates 5S from "standardized cleanup" is Seiton.

Shining or Sweeping or Cleanliness / Systematic Cleaning (Seiso): Maintain a clean and well-organized workspace. Clean up the work area at the end of each shift to make sure everything is back in its proper position. This makes it simple to figure out what goes where and means that everything is in its proper place. A big argument is that keeping things tidy can be part of everyday work, not something done just when things get too dirty.

Standardizing (Seiketsu): Work processes should be systematic and reliable. All should be aware of that fact for following the first three S's.

Sustaining the discipline (Shitsuke): Standards must be maintained and reviewed. The previous four S's become the modern way of doing things after they've been created. Maintain your attention on this new path and do not allow yourself to fall back into old habits. When considering the current approach, consider alternative approaches as well. Review the first four S's and make corrections if needed as a problem occurs, such as a proposed upgrade, a new way of operating, a new instrument, or a new production requirement.



Jishu hozen (Autonomous Maintenance)

This pillar is focused on the idea that if operators take care of minor maintenance duties, professional maintenance personnel will focus on higher-value activities and technical fixes. The technicians are responsible for keeping their machinery in good working order on a regular basis to avoid it degrading. The aim of using this pillar is to keep the system in fresh shape. Cleaning, lubricating, visual inspection, locking of loosened bolts, and other basic tasks are involved. JISHU HOZEN (Autonomous Maintenance) aims to run equipment without breaking down, have versatile and agile operators that can operate and maintain other equipment, and eliminate faults at the source by active employee involvement.

Planned Maintenance

It is the aim to provide trouble-free machines and appliances that do not break down, as well as to produce high-quality products that have complete customer satisfaction. Preventive maintenance, breakdown maintenance, corrective maintenance, and maintenance prevention are also examples of maintenance. Planned Maintenance is a constructive approach to equipment maintenance that employs skilled maintenance personnel to assist operators in properly maintaining their facilities. The aim of planned maintenance is to achieve and preserve system readiness, reduce maintenance costs, increase machine reliability and maintainability, eliminate machinery failure and breakdown, and ensure that replacement parts are still available.

Kaizen

Kaizen roughly translates to "improvement by transition." Kaizen entails minor incremental changes that are carried out on a continuous basis by individuals at all levels of the organization. The Kaizen theory states that "in an operational environment, a large number of minor changes are more successful than a few large improvements." This pillar aims to reduce job losses that have an effect on our productivity. We remove losses in a comprehensive manner using different Kaizen methods by following a specific and rigorous protocol. Kaizen's aim is to gain and maintain zero losses in small stops, calculation and corrections, errors, and unexpected downtime.

Quality Maintenance

Its goal is to provide the best possible service to customers by delivering high-quality products. After defining the system parameter that influences product consistency, faults are removed from the process by focused development. Quality Control to Quality Assurance is the transition.

Training

Continuous progress is only possible by continuous improvement of people's expertise and skills at various levels.

Office TPM

The office TPM pillar comes after the other four TPM pillars (JH, Kaizen, QM, PM). To increase the effectiveness and performance of administrative tasks, office TPM must be observed. Analyzing systems and methods that can be streamlined falls into this category. Processing loss, cost loss (including procurement, accounts, marketing, and sales), communication loss, idle loss, set-up loss, accuracy loss, office equipment breakdown, communication channel breakdown, telephone and fax lines, and time spent retrieving information are among the nine major losses addressed by Office TPM.

Safety, Health and Environment

The aim of this pillar is to ensure that our processes and policies do not endanger our employees or the environment. The plant places a high priority on safety. Manager of the safety branch, in charge of all safety-related duties. The aim of this pillar is to have no accidents, no health problems, and no explosions.



5. CONCLUSION

It states that further research into the role of TPM in manufacturing industries is required. TPM improves the availability, production reliability, and quality rate of the equipment, resulting in increased overall equipment effectiveness. TPM has also been used to produce zero breakdowns, faults, or accidents.

TPM aspires to build workplace cultures that are capable of adapting to evolving market conditions, technical advancements, equipment complexity, and management creativity.

TPM is a maintenance mechanism that encourages effective maintenance while also contributing to a healthy safety culture through managerial incentives, engagement, workforce interaction, networking, knowledge and training, working practices and processes, morale and job satisfaction, and attitude and risk perception.

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