

# Implementation of Total Productive Maintenance

Chandrakanth H S<sup>1</sup>, Dr. M.Mohanram<sup>2</sup>

P G Student, Department of Industrial & Production Engineering, The National Institute of Engineering, Mysuru,  
Karnataka, India<sup>1</sup>

Associate Professor, Department of Industrial & Production Engineering, The National Institute of Engineering, Mysuru,  
Karnataka, India<sup>2</sup>

**ABSTRACT:** Importance of TPM which stands for Total Productive maintenance for Liberalization of global economy has resulted tough competition in global market and for the sustainability in market for any product or service, the optimization of resources and costs in all sorts is required. The global competition is based on the innovation of advanced products, processes etc. and technology support is the essential requirement for any advancement in product or process where concept of Total productive maintenance has very much relevance today where it focus on improvement in equipment availability, performance and quality with assuring health and safety of employees and protection of environment. TPM provides a method for the achievement of world class levels of overall equipment effectiveness through people and not through technology or systems alone. It includes the organizational structures, human interactions, analytical tools and success criteria associated with the implementation of Total Productive Manufacturing programs.

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

## I. INTRODUCTION

In today's industrial scenario huge losses/wastage occur in the manufacturing shop floor. This waste is due to operators, maintenance personal, process, tooling problems and non-availability of components in time etc. Other forms of waste includes idle machines, idle manpower, break down machine, rejected parts etc. are all examples of waste. The quality related waste are of significant importance as they matter the company in terms of time, material and the hard earned reputation of the company. There are also other invisible wastes like operating the machines below the rated speed, start up loss, break down of the machines and bottle necks in process. Zero oriented concepts such as zero tolerance for waste, defects, break down and zero accidents are becoming a pre-requisite in the manufacturing and assembly industry. In this situation, a revolutionary concept of Total Productive Maintenance (TPM) has been adopted in many industries across the world to address the above said problem.

The goal of the any TPM program is to improve productivity and quality along with increased employee morale and job satisfaction. Earlier preventive maintenance was considered as non value adding process, but now it is essential requirement for longer life cycle of machines in an industry. TPM is an innovative approach to maintenance that optimizes equipment effectiveness, eliminates breakdowns, and promotes autonomous operator maintenance through day-to-day activities involving the total workforce.

## II. 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. I. P. S. Ahuja et al.[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.

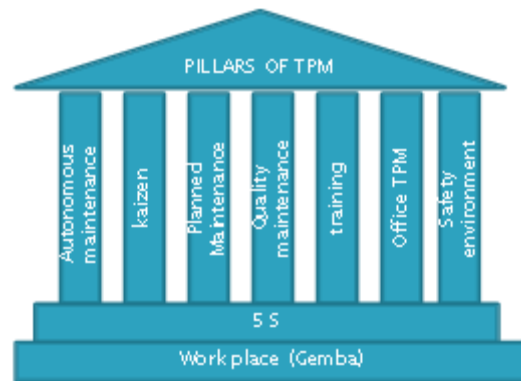


Fig. 1 Pillars of TPM

## III. TPM IMPLEMENTATION

TPM focuses on optimizing planning and scheduling. Availability, performance and yield are other factors that affect productivity. Availability losses arise from breakdowns and change-over, i.e., the situation in which the line is not running when it should be. Performance losses arise from speed losses and small stops or idling or empty positions. In this case, the line may be running, but it is not producing the quantity it should. Yield losses consist of losses due to rejects and poor start-up behavior in the line producing the products. These losses lead to low values of the overall equipment effectiveness (OEE), which provides an indication of how effective the production process is. TPM helps to raise the value of the OEE by supplying a structure to facilitate the assessment of these losses. Application of TPM leads to both short- and long-term improvements

### TPM Implementation Stage

#### Stage A-Preparatory stage;

Step 1-Announcement by management to all about TPM introduction in the organization: Proper Understanding, commitment and active involvement of the top management is needed for this step. Senior management should have awareness programmes, after which announcement is made. Decision to implement TPM is published in the in-house magazine, displayed on the notice boards and a letter informing the same is sent to suppliers and customers.

Step 2-Initial education and propaganda for TPM: Training is to be done based on the need. Some need intensive training and some just awareness training based on the knowledge of employees in maintenance..

Step 3-Setting up TPM and departmental committees: TPM includes improvement, autonomous maintenance, quality maintenance etc., as part of it. When committees are set up it should take care of all those needs.

Step 4-Establishing the TPM working system and target: Each area/work station is benchmarked and target is fixed up for achievement.

Step 5-A master plan for institutionalizing: Next step is implementation leading to institutionalizing where in TPM becomes an organizational culture. Achieving PM award is the proof of reaching an satisfactory level.

#### **Stage B-Introduction stage**

A small get-together, which includes our suppliers and customer's participation, is conducted. Suppliers as they should know that we want quality supply from them. People from related companies and affiliated companies who can be our customers, sisters concerns etc. are also invited. Some may learn from us and some can help us and customers will get the message from us that we care for quality output, cost and keeping to delivery schedules.

#### **Stage C-TPM implementation**

In this stage eight activities are carried which are called eight pillars in the development of TPM activity. Of these four activities are for establishing the system for production efficiency, one for initial control system of new products and equipment, one for improving the efficiency of administration and are for control of safety, sanitation as working environment.

#### **Stage D-Institutionalizing stage**

By now the TPM implementation activities would have reached maturity stage. Now is the time to apply for preventive maintenance award.

### **IV. TPM IMPLEMENTATION STEPS**

TPM concept is implemented in a phased manner in a machine shop of a company manufacturing automotive components. In each phase one TPM pillar is implemented. Overall equipment effectiveness (OEE) is taken as a measure of success of TPM implementation.

TPM starts with 5S. 5S can be called as foundation stone of TPM implementation. It is a Japanese way of housekeeping. Problems cannot be recognized is the work place is unorganized. Cleaning and organizing the workplace helps us to pop up the problems. Making problems visible and seen to the people gives an opportunity of improvement. If this 5S is not taken up seriously, then it leads to 5D i.e. Delays, Defects, Dissatisfied customers, Declining profits and Demoralized employees.

#### **Phases of 5S**

There are 5 primary phases of 5S: sorting, straightening, systematic cleaning, standardizing, and sustaining. Additionally, there is an additional phase, safety, that is sometimes included.

**Sorting (Seiri):** Differentiate between the necessary and unnecessary and discard the unnecessary. Eliminate all unnecessary tools, parts, instructions: work-in-process; unnecessary tools; unused machinery; defective products; papers and documents. Go through all tools, materials, etc., in the plant and work area. Keep only essential items. Everything else is stored or discarded.

**Setting in Order (Seiton):** There should be a place for everything and everything should be in its place. The place for each item should be clearly labeled or demarcated. Items should be arranged in a manner that promotes efficient work flow. Workers should not have to repetitively bend to access materials. Each tool, part, supply, piece of equipment, etc. should be kept close to where it will be used (i.e. straighten the flow path). Seiton is one of the features that distinguishes 5S from "standardized cleanup".

**Shining or Sweeping or Cleanliness / Systematic Cleaning (Seiso):** Keep the workplace tidy and organized. At the end of each shift, clean the work area and be sure everything is restored to its place. This makes it easy to know what

goes where and ensures that everything is where it belongs. A key point is that maintaining cleanliness should be part of the daily work – not an occasional activity initiated when things get too messy.

**Standardizing (Seiketsu):** Work practices should be consistent and standardized. Everyone should know exactly what his or her responsibilities are for adhering to the first 3 S's.

**Sustaining the discipline (Shitsuke):** Maintain and review standards. Once the previous 4 S's have been established, they become the new way to operate. Maintain focus on this new way and do not allow a gradual decline back to the old ways. While thinking about the new way, also be thinking about yet better ways. When an issue arises such as a suggested improvement, a new way of working, a new tool or a new output requirement, review the first 4 S's and make changes as appropriate.

#### **Jishu hozen (Autonomous Maintenance)**

This pillar is based on the concept that if operators take care of small maintenance tasks it will free up the skilled maintenance people to concentrate on more value added activity and technical repairs. The operators are responsible to upkeep their equipment on daily basis to prevent it from deteriorating. By use of this pillar, the aim is to maintain the machine in new condition. The activities involved are simple nature like cleaning, lubricating, visual inspection, tightening of loosened bolts etc. Objective of JISHU HOZEN (Autonomous maintenance) are operation of equipments without breakdown, versatile and flexible operators to operate and maintain other equipments and eliminating the defects at source through active employee participation.

#### **Planned Maintenance**

It is aimed to have trouble free machines and equipments without any breakdown and producing components to the quality level giving total customer satisfaction. Maintenance can be carried out as Preventive Maintenance, Breakdown Maintenance, Corrective Maintenance and Maintenance Prevention. Planned Maintenance is a proactive approach which uses trained maintenance staff to help train the operators to better maintain their equipment. Objective of Planned Maintenance are to achieve and sustain availability of machines, optimum maintenance cost, improve reliability and maintainability of machines, zero equipment failure and break down and ensure availability of spares all the time.

#### **Kaizen**

“Kaizen” literally means “change for the betterment”. Kaizen involves small improvements and is carried out on a continual basis and involving people of all level in the organization. The principle behind Kaizen is that "a very large number of small improvements are more effective in an organizational environment than a few improvements of large value". This pillar is aimed at reducing losses in the workplace that affect our efficiencies. By using a detailed and thorough procedure we eliminate losses in a systematic method using various Kaizen tools. Objective of Kaizen is achieve and sustain zero losses with respect to minor stops, measurement and adjustments, defects and unavoidable downtime.

#### **Quality Maintenance**

It is geared towards achieving customer satisfaction through delivery of highest quality product. Through focused improvement defects are eliminated from the process after identifying the parameter of machine which affects the product quality. Transition is from Quality Control to Quality Assurance.

#### **Training**

Continuous improvement is possible only through continuous improvement in knowledge and skill of the people as different levels.

#### **Office TPM**

Office TPM is the pillar which follows other four other pillars of TPM (JH, Kaizen, QM, PM). Office TPM must be followed to improve productivity and efficiency of the administrative functions. This includes analyzing processes and procedures which can be automated. Office TPM addresses nine major losses which are processing loss, cost loss including in areas such as procurement, accounts, marketing, sales leading to high inventories, communication loss, idle loss, set-up loss, accuracy

loss, office equipment breakdown, communication channel breakdown, telephone and fax lines and time spent on retrieval of information.

### **Safety, Health and Environment**

The purpose of this pillar is to create a safe workplace and a surrounding area that is not damaged by our process or procedures. Utmost importance to Safety is given in the plant. Manager - safety department looking after functions related to safety. Objective of this pillar are to achieve zero accident, zero health damage and zero fires.

### **V. CONCLUSION**

It observes that there is a need for further study on the role of TPM in manufacturing industries. TPM increases the availability, performance efficiency and the quality rate, results in improvement of the overall equipment effectiveness of the equipment. TPM also used to achieve zero breakdowns, zero defects and zero accident.

TPM aims to create corporate environments able to respond positively to the changing business climate, technological advances, equipment sophistication, and management innovation. TPM is a maintenance system which promotes productive maintenance but it also contributes to a positive safety culture through management incentive, management commitment, participation of management and workers, communication, education and training, working conditions and procedures, morale and job satisfaction, and attitude and risk perception.

It increases the availability, performance efficiency and the quality rate, results in improvement of the overall equipment effectiveness of the equipment. TPM also used to achieve zero breakdowns, zero defects and zero accident. However, it is observed that there is a need for further study on the role of TPM in manufacturing industries. Based on the findings of this review therefore it is suggested that more tangible benefits to be addressed by future research related to TPM.

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