

A Case Study in Improving of Productivity using TPM as a Tool

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Abstract— In present highly competitive age, every manufacturing organization needs to improve its productivity to make profit. Productivity improvement depends on the manufacturing performance of the organization which is the function of Overall Equipment Effectiveness (OEE) which can be maximized by optimizing three parameters availability, performance and quality through minimizing industrial waste (six big losses). Optimization of above three parameters can be achieved through better maintenance practice by the manufacturing organization that requires a tool/technique to do same. It has been found that Total Productive Maintenance (TPM) is one of the effective tool/technique which is aimed to maximize the OEE by optimizing three parameters through reducing the industrial waste. TPM is a resource emphasized maintenance approach possesses the philosophy of “continuous improvement”, which may be successfully executed with total employee involvement and the management resolution for continuous practice of TPM. In the present research a case study is pursued in a medium scale manufacturing organization “Arvee Enterprises, Govindpura, Industrial area, Bhopal” with the objective to implement the TPM and evaluating its effects on OEE of plant and OEE of lathe machine and drill machine. Results of study indicate that significant enhancement in the OEE of plant and machines could be achieved by implementing TPM in organization.

Key words: Total Productive Maintenance (TPM), Overall Equipment Effectiveness (OEE), Total Employee Involvement, Manufacturing Performance

I. INTRODUCTION

TPM is an innovative Japanese concept in response to the maintenance and support problems encountered in manufacturing environment and was an equipment management strategy design to support total quality management (TQM). According to the Japanese institute of Plant Engineers (JIPE), TPM defined as a “ Team-based maintenance strategy, designed to maximize equipment effectiveness by establishing a comprehensive maintenance production system covering the entire life of equipment related fields (planning, use and maintenance) and involving everyone from top management executive to the production floor operators”, (Nucobe , 2009). According to Nakajima the word “Total” in “Total Productive Maintenance” has three meaning describe the principal features of TPM, (Nakajima, 1989).

A. Total Effectiveness

Indicates TPM’s pursuit total equipment effectiveness which includes availability, performance, product quality, safety and health at work place and also productivity of organization.

B. Total Maintenance System

Includes maintenance prevention and maintainability improvement as well as preventive maintenance it refers to maintenance-free design through the incorporate of reliability, maintainability and availability characteristics into the equipment design.

C. Total Participation of all Employees

Includes autonomous maintenance by operator through small group activities promotes planned maintenance through training, education and motivation management. TPM activities focus on eliminating the six major losses. These losses include equipment failure, set-up and adjustment time, idling and minor stoppages, speed reduction, defective product-quality loss, (Nakajima, 1988).

II. LITERATURE REVIVE

A. Objectives

The objectives of this project are to implement the TPM in a manufacturing organization and evaluate its effects on OEE (Manufacturing Performance & Productivity Improvement) and also achieving the healthy industrial working environment. Implementing TPM in manufacturing organization and evaluating its effect on overall equipment effectiveness (OEE) of machines and plant as well.

This study helps in finding way-out in a very simple and cost effective manner for a manufacturing organization to implement TPM.

With the help of this study the medium and small scale manufacturing organization’s industrial management and staff can motivate to own self for adopting new favorable trends. This study will justify its objective by providing facts in terms of calculations of OEE in any shop floor and overall plant to evaluate effect of implementation of TPM in industry.

III. TPM PILLARS

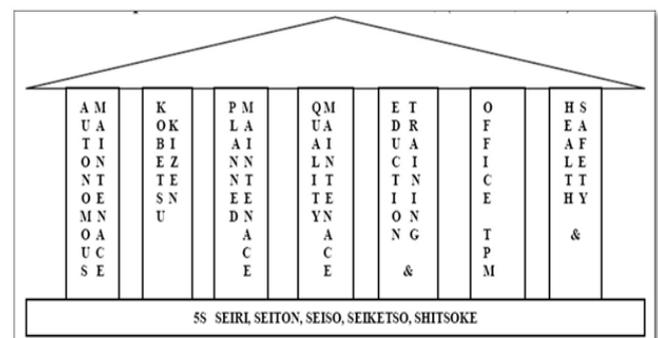


Fig. 1:

The basic practices of TPM are often called the Pillars of TPM. The entire structure of TPM is built and stands, on eight pillars .TPM concretes way for excellent planning,

organizing, monitoring and controlling practices through its unique eight-pillar methodology. The core TPM initiatives classified into eight TPM pillars or activities for accomplishing the manufacturing performance improvements include autonomous maintenance, focused maintenance, planned maintenance; quality maintenance, education and training, office TPM, development management, and safety, health and environment .

A. PILLAR 1– 5S

TPM starts with 5S. It's a system of process improvement through reduction in waste cleaning workplace. It's a systematic process of housekeeping to achieve good environment or a clean and clear in the workplace. If this 5s is not taken up seriously, then it leads to 5D i.e. Delays, Defect, Dissatisfied customers, declining profit and Demoralized employees. Following are the element of 5S.

1) SEIRI-Sort-Out

This means sort-out unnecessary items from the shop floor or workplace and removes them.

2) SEITON-Set in Order

This means that arrange items i.e. necessary items in a proper order to that they can be easily picked up for use when required.

3) SEISO-Shine

This means cleaning the workplace free of burrs, grease, oil, water, waste, Scrap etc. i.e. cleaning the work piece completely.

4) SEIKETSO-Standardizations

This means maintain high standard for keeping the workplace, Machine, pathways neat and clean.

5) SHITSOKE-Self-Discipline

This means train and motivates people to follow good housekeeping discipline autonomously.

B. PILLAR 2 Autonomous Maintenance

Means maintain his equipment by himself. The concepts of this pillar are to take care of small maintenance task. In this the operator are responsible to upkeep their equipment on daily basis so as to prevent it from deteriorating. The activities involved in this are daily inspection, lubrication, minor repair, part replacement. The abnormalities are eliminated by using the technique such as abnormality sheet, inspection, and lubrication sheets.

C. PILLAR 3 Kaizen

In this KAI means “change” and ZEN means “good”. Generally kaizen is for small improvement and it involves all people from the organization. The principle behind kaizen is that a very large number of small improvements are more effective in an organization than a few improvement of large value. The aim of this pillar is to reduce losses in the workplace that affect our efficiencies. The objective of kaizen is to achieve and sustain zero losses with respect to minor stops, measurement and adjustment, defect and unavoidable downtime. The tool used in kaizen are why-why analysis (root cause analysis), poka-yoke i.e. mistake proofing.

D. PILLAR 4 - Planned Maintenance

This pillar aimed toward to have a trouble free machine and equipment for improving the reliability and maintainability

and also for total customer satisfaction for the products. Planned Maintenance is mainly divided into four categories:

- 1) Preventive maintenance.
- 2) Breakdown maintenance.
- 3) Corrective maintenance.
- 4) Predictive Maintenance

E. PILLAR 5 - Quality Maintenance

This pillar aimed toward achieving the customer requirement through highest quality through defect free manufacturing through focused improvement, defect the process after identifying the parameters of machine which mainly affect the products. Transition is from quality control to quality assurance.

F. PILLAR 6 - Training & Education

This pillar aimed skills diversification of an employee whose morale is high and who has eager to come to work and perform all required function effectively. In this an operator is educate as per required. So that he/she will be able to solve the problem. The goal is to create a factory full of expert. Training policy is focus on improvement of knowledge, skills and technique.

The different phase of skill is following:

- Do not know.
- Know the theory, but cannot do.
- Can do but cannot teach.
- Can do and also teach.

G. PILLAR 7 - Office TPM

This pillar should be started after its successful activating of four pillar of TPM which are JH, Kaizen, QM, PM office TPM must be followed to improve productivity and efficiency of the administrative functions. Due analyzing process and procedures towards increasing in the office automation office TPM has some major losses such as processing loss, cost loss, idle loss, setup loss, office equipment breakdown.

H. PILLAR 8 - Safety, Health & Environment

In this area focus is on to create a safe workplace and a surrounding area that is not damaged by our process or procedures. This pillar will play an active role in each of the other pillars on a regular basis. A committee is constituted for this pillar which representative of officers as well as workers. The committee is headed by senior vice President (Technical). Utmost importance to Safety is given in the plant. Manager (Safety) is looking after functions related to safety. To create awareness among employees some social and group activities may be organized by the organization like, quiz contest, drama, posters presentation etc. related to the safety aspects,

IV. STAGES TO IMPLEMENTATION OF TPM

A. Stage 1 - Preparatory Stage

- 1) Step 1 - Announcement by Management to all about TPM introduction in the organization.
- 2) Step 2 - Initial education and propaganda for TPM.
- 3) Step 3 - Setting up TPM and departmental committees.

- 4) Step 4 - Establishing the TPM working system and Target
- 5) Step 5 - A master plan for institutionalizing

B. Stage 2 - Introduction Stage

This is a ceremony and we should invite all. Suppliers as they should know that we want quality supply can be our customers, sisters concerns etc. Some may learn from us and some can help us and customers will get the communication from us that we care for quality output.

C. Stage 3 – 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.

D. Stage 4 - Institutionalizing Stage

By all their activities one would has reached maturity Stage. Now is the time for applying for PM award. Also think of challenging level to which you can take this movement.

V. RESULTS & DISCUSSION

1) Productivity Improvement

Productivity is improved through fewer losses in the company.

2) Quality Improvement

Quality is improved as a result, that the failures and malfunctions is reduced.

3) Cost Reduction

The cost is reduced because the losses and other not value added work is reduced.

4) Employee Ownership

Ownership of equipment by operators through Autonomous Maintenance

5) Employee Confidence

"Zero failure", "zero defect" and "zero accident" conditions builds employee self-confidence.

6) Improved working environment

Clean working conditions provides a good working environment.

Increased Plant Reliability Customer

7) Satisfaction

TPM leads to high delivery performance and customer satisfaction.

VI. CONCLUSION

Now a day in the competitive world the industrial scenario is Rapidly change and the production system having a lot of force improve productivity and enriching the Quality , performance and profit the Total productive Maintenance is one of the tool to fulfill the conditions And achieving the organization goals. TPM strategies and pillars an industry may achieve the higher degree of equipment effectiveness which results improvement in manufacturing performance through elimination of losses and higher rate of productivity which increase profitability of the organization.

Autonomous maintenance activities were carried out with total employee participation. The investment in training and education managed to boost operator's morale and the commitments towards company's goals.

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