

IMPLEMENTATION OF TOTAL PRODUCTIVE MAINTENANCE: A CASE OF DEVELOPING COUNTRIES

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ABSTRACT

The paper seeks to give a guideline on the implementation of Total Productive Maintenance (TPM) in a typical manufacturing facility. It further shows the importance of the commitment and involvement of the management in the implementation and sustaining of continuous improvement as well as involvement in strategic changes particularly in the implementation of Total Productive Maintenance (TPM) for all employees. TPM is a dynamic, team-based methodology for involving all employees in identifying and eliminating equipment related losses such as equipment failure, lengthy set-up time, inconsistent adjustment procedures, idling and minor stoppages, reduced production yields, processing defects, etc. It combines preventive maintenance with Japanese concepts of total quality control and total employee involvement. The paper concludes by affirming the possibility of using the holistic TPM approach which is people centred.

Keywords – Total productive maintenance, customer satisfaction.

I. INTRODUCTION

The principles of Total Productive Maintenance (TPM) have been around for some time and much hard work has been done on the subject by various organisations. TPM is about harnessing human and material resources in the most effective way to achieve an organisation's objectives (Ireland and Dale, 2001). It is a management philosophy which recognises that customer satisfaction, plant and people's health, safety, environmental considerations and business objectives are mutually dependent.

Investment in material things is an accepted and well developed management practice but the application of TPM primarily involves investment in time, people and systems: time to implement new concepts, time for people to recognise the benefits, and time for people to move forward into new and different company cultures. The participation organisation has to take this vision on board if TPM is to succeed.

The objectives and goals of TPM can be many and are for the organisation to decide. These may include customer satisfaction, business

objectives such as profit growth and market growth. The objectives should include responsibility towards society including the healthy and safety of people within the organisation, the customers receiving the product or service and the need to protect the environment.

In industrial set ups, the main focus is usually on maintenance; which is the management, control, execution and quality of those activities which will ensure that optimum levels of availability and overall performance of plant are achieved, in order to meet business objectives. In 1988, the Department of Trade and Industry, UK, commissioned a report "Managing Maintenance into the 1990s". One conclusion of this report was that a 5% improvement in machine availability could result in a 30% improvement in net profit. (Mugwindiri 2009-2000).

2. Total Productive Maintenance Tenets

The following points are key to formulate a TPM strategy.

- **Commitment**

There must be commitment from the Managing Director down through to all members of the organisation. Each person needs to be committed to and accountable for continuous quality improvement of their work. For example, plant operators are encouraged to take ownership of their machines and come up with a parlour plant (as clean as a living room) and attend to the minor maintenance tasks which can account for the major maintenance losses.

- **Customer Satisfaction**

Understanding and satisfying customer needs and expectations should be a key objective, remembering that many members of an organisation do not have direct contact with the external customer. It is important to remember that a dissatisfied customer rarely returns. At a local level, it should also be borne in mind that each person has a customer and a supplier even on the factory floor.

- **Quality losses**

Quality losses are caused by the failure to use most effectively and efficiently the potential of human, financial and material resources. Quality losses can include loss of customer satisfaction, loss of the opportunity to add more

value to the product, the organisation or society, and the waste or misuse of resources which affect people's health, damage property or interrupt a process. TPM involves a major culture change and a change of the mind set. And because it is a philosophy, maintenance techniques that enhance quality, such as Reliability Centre Maintenance, Enhance Process control and Condition based Maintenance can easily be incorporated into the programme in order to achieve the desired goals. Continuous attention needs to be given to the removal of prejudices and restrictive structures that inhibit the effectiveness of the organisation. All efforts must be made to bridge the corporate governance gap and to get rid of the "us and them" attitude.

- **Participation by all**

The total strengths and abilities of all members of an organisation should be fully and effectively harnessed and used; and should be recognised as links in a chain. This is usually achieved through the use of small group activities to achieve certain agreed goals. It is usually recommended that the composition of these small groups cuts across functional boundaries.

- **Process measurements and continuous improvement**

Process measurements should be applied to all organisational activities not just on the shop floor but even in administrative work. The means of improving the performance of people and processes need to be continually sought and monitored, building upon the current process measurements and acceptable standards (Mugwindiri 2003-4). Provision for identification and resolution of potential and existing problems on a continuous basis is essential.

- **Personal accountability and development**

Recognition of individual responsibility and authority should be accepted by all. Overall system performance and indeed the success of TPM implementations hinges on small groups and personal accountability (Gorelick 1998). There should be continuous appraisal, training and development of individuals at all levels.

3. Implementing Total Productive Maintenance

A typical TPM process should start with three key areas: policy and strategy, management and improvement of the organisation.

3.1 Policy and Strategy

Management needs to establish a mission statement, strategic corporate objectives, and a business plan for achieving the TPM objectives. There also needs to be a visible and sustained

commitment from every member of the business through personal leadership and example (Moubray 1998). Roles, responsibilities and objectives for each level of the organisation need to be established and maintained. These need to support the mission and corporate objectives.

3.2 Management

The next step requires planning to establish an effective organisational structure, establish, audit and keep under review an effective management system. The organisation will also need an effective, planned information system and a good communication system both internally and externally with suppliers and customers.

3.3 Improving the Organisation

This means looking at the working environment, the measurement of performance, improvement objectives and plans, and monitoring and reviewing processes. The physical environment and relationship between the individual and the organisation and other employees should be structured so that each individual and team is aware of its contribution to the mission statement and the planned methods by which it can make improvements.

Improvement goals need to be closely integrated with the corporate objectives and should be considered separate to new capital intensive projects. Plans for improvement of product service, process quality, safety, environmental impact dependability and customer satisfaction are needed at all levels of any process.

It is important to ensure that all plans, targets and performance measurement throughout the organisation compliment each other and reflect the overall objectives of the mission statement, and help to review the results of improvement plans to obtain a measure of their effectiveness. Equally important is to have an effective reporting and feedback mechanism and structure.

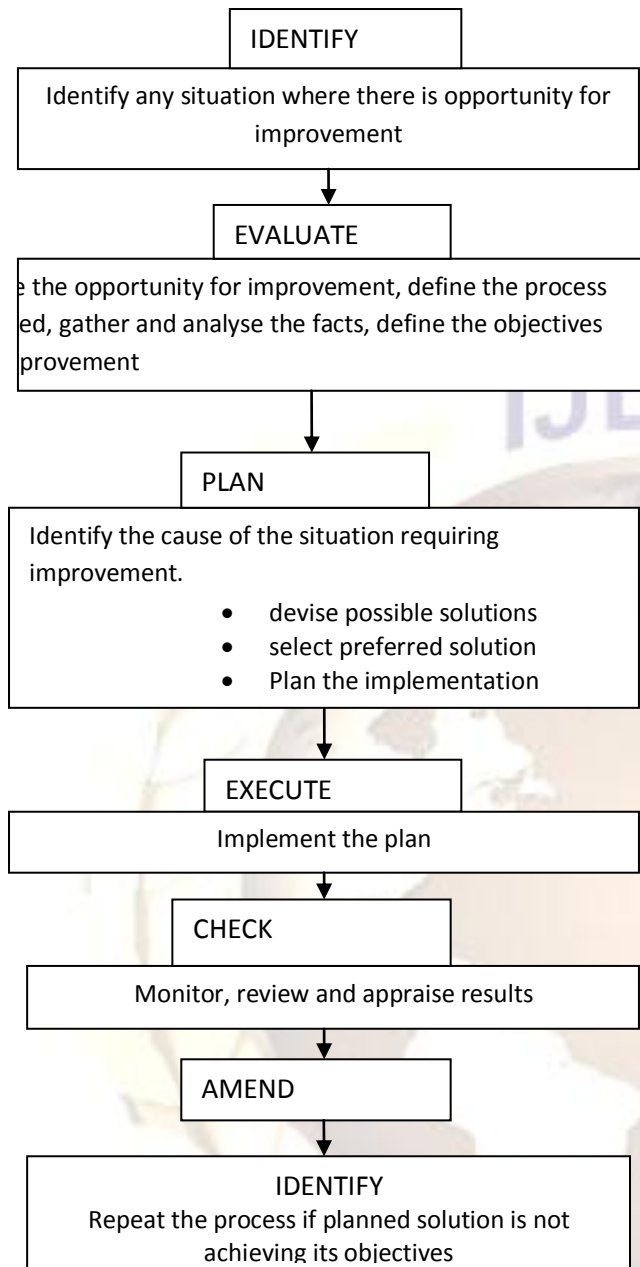


Figure 1. The Steps for Systematic TPM Improvement

An effective way of implementing TPM is through the use of small group activities. These are actually achieved by using three main Task Groups.

1. A management task group 1.
2. An engineering task group 2.
3. A production task group 3.

The management task group will be responsible for:

- Formulating the TPM policy and objectives
- Selling the TPM philosophy to the whole plant personnel. The information should clearly

describe the maintenance policy, TPM concept and why it is going to be implemented in the factory.

- Staff training.
- Executives and the Managing Director should show enthusiasm in the implementation of the TPM.
- Introductory Seminars to remove resistance to change are necessary.
- Formulation of master plan is imperative.
- Kick off of TPM programme, usually in the factory grounds, and attended by sister companies, suppliers etc.

The other Task Groups, 2 and 3 are responsible for:

- Defining current problems in their areas.
- Analysing the problem areas and bottleneck operations.
- Identification of every condition potentially related to the problem.
- Evaluation of the equipment, materials and malfunctions.
- Planning and investigating functions and malfunctions.
- Improving plant availability for both task groups 2 and 3.
- Implementation of autonomous maintenance for operators for task group 2.
- Increasing plant utilisation for task group 2.
- Autonomous maintenance can be achieved by using the five S's or 7 Nakajima steps of stage 8 in the 12 step TPM implementation plan.
- 5S's stand for Seiri (Organisation), Seiton (Tidiness), Seiso (Cleaning) and Seiketsu (Discipline), Shitsuke (Training). The engineering task group shall also handle training and education.
- Preventive maintenance, reduction of breakdowns through continuous improvements, spare part consumption reduction, maintenance for quality and reliability.

4. Conclusion

It is important to note that the implementation groups are not mutually exclusive but have to interact. This is important especially on the implementation and reviewing of TPM performance as indicated in **Figure 1**, the steps for systematic TPM improvement. The benefits achieved will form the basis of a Kaizen path (continuous improvement cycle).

The implementation of TPM is usually done in tandem with an organisation structural change: the new proposed policy would have a deliberate bias towards TPM to complete the TPM implementation. The implementation of this policy is sure to improve performance efficiency and effectiveness. The centrality of Total Productive

Maintenance (TPM) and its overarching importance more than ever before in maintenance systems has clearly been brought out.

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