

DEVELOPMENT OF FRAMEWORK FOR EFFECTIVE IMPLEMENTATION OF TPM IN ENGINEERING EDUCATION INSTITUTE

**Prof. Rahul V. Dandage¹, Mr. Prasad K.Hajare², Mr.Manoj V.Dhebe³,
Mr.Amitraj U. Lad⁴, Mr.Santosh S.Pinjari⁵**

¹Asst.Prof., ^{2,3,4,5}UG Student , Mechanical Engineering Department ,RM CET Devrukh, (India)

ABSTRACT

Engineering educational institutes are growing in numbers in India in the recent years. Every institute has various laboratories and workshop which are equipped with variety of instruments, equipment and machineries for demonstration and conduction of practical for the students. The frequency of using any instruments or equipments is twice or thrice in a year. For the remaining duration the equipment is in idle condition. Due to this, there is lack of proper maintenance which results in the failure of equipment when it is to be used. To overcome this difficulty, we are developing some appropriate maintenance framework which will keep the equipment in proper working conditions whenever required. Total productive maintenance (TPM) is a tool which is very useful in these conditions. In this paper we have proposed some laboratorial preventive maintenance activities which will helpful to keep the laboratories in well condition.

Keywords: TPM, Framework, Engineering Educational Institutes, Preventive Maintenance

I. INTRODUCTION

The major differences between TPM and other concepts is that the operators are also made to involve in the maintenance process. In this concept is “I (Production operators) operates, You (Maintenance department) fix” is not allowed. So TPM implementation is very necessary to keep instruments neatly and in operating in good condition. By implementation of TPM in laboratories of mechanical department of engineering college, the maintenance activity will conduct smoothly and students will get equipments in good working condition at any time. The goal of TPM implementation is to improve overall equipment efficiency of machines and get précised results. TPM is an innovative approach to maintenance that optimizes equipment effectiveness, eliminates breakdowns, and promotes autonomous operator maintenance through day-to-day activities in workshop. The implementation of 8 pillars of TPM is carried out in phased manner and impact of each pillar specifically occurred.

1.5-S

2. Autonomous maintenance (Jishuhozen)

3. Kobetsu-kaizen

4. Planned maintenance

5. Quality maintenance

6. Training
7. Office TPM
8. Safety, health and environment

II. LITERATURE REVIEW

2.1 Phases of TPM implementation[1]

2.1.1 5-S

TPM starts with 5S. 5S can be called as foundation stone of TPM implementation. 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. Meaning of each 'S' is explained in Table 1.

Table 1: Meaning of 5-S

Japanese Term	English translation	Equivalent 'S' term
Seiri	Organization	Sort
Seiton	Tidiness	Systematize
Seiso	Cleaning	Sweep
Seiketsu	Standardization	Standardize
Shitsuke	Discipline	Self-discipline

2.1.2 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.

2.1.3 Planned Maintenance

Planned Maintenance is a proactive approach which uses trained maintenance staff to help train the operators to better maintain their equipment. Maintenance can be carried out as Preventive Maintenance, Breakdown Maintenance, Corrective Maintenance and Maintenance Prevention

In our case, we can implement above two pillars by developing user friendly software which guides lab asst. about better maintenance.

2.1.4 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”.

By using detailed and through procedure we eliminate losses in a systematic method using various kaizen tools.

1. Informative charts beside every equipment
2. Pokayoka device

2.1.5 Quality Maintenance

It is geared towards achieving customer satisfaction through delivery of highest quality product. Transition is from Quality Control to Quality Assurance.

For this pillar we are developing precaution as well as procedure charts for every experimental set up which will help to students for their practical performance.

2.1.6 Training

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

To implement this pillar TPM team will organize training session which is helpful to lab assistants to update knowledge about TPM.

2.1.7 Office TPM

Office TPM is the pillar which follows other four other pillars of TPM (Autonomous Maintenance, Kaizen, QM and 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 major losses which are processing loss, cost loss including in areas such as procurement, accounts, communication loss, idle loss, set-up loss, accuracy loss, office equipment breakdown losses.

Lab in-charge should be able to keep all records regarding maintenance of their respective laboratories to implement this pillar effectively.

2.1.8 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. Objective of this pillar are to achieve zero accident, zero health damage and zero fires.

For implementation of this pillar, we are preparing safety charts, precaution charts for awareness about safety, health and environment. This pillar implementation is depends on operator, culture of organization and disciplinary attitude.

2.2 Barriers in TPM implementation[2]

2.2.1 Lack of top management commitment

TPM programs can be effective if and only if the top management is totally committed and involved.

2.2.2 Resistance to change

This is a direct off-shoot from the lack of top management commitment.

2.2.3 Lack of knowledge of TPM

Many engineering institute are not able to successfully implement TPM due to insufficient knowledge on TPM. Before announcing and implementing TPM programs, it is imperative that send senior personnel to industries where TPM has been successfully implemented to learn the nuts and bolts of TPM implementation.

2.2.4 Attitude towards responsibilities

This is directly related to work culture in laboratories where-in frequent breakdowns are tolerated and not analyzed, processes are inefficient, observation quality is not checked and student feedback not monitored. Lab in-charge have to become involved in routine maintenance and improvement activities that halt accelerated deterioration, control contamination and help to prevent equipment problems.

2.2.5 Maintenance management process

To implement TPM, management and lab in-charge should embrace technology. Maintenance management process should be computerized to have ready access to the schedules and failure analysis reports, which should

be uploaded on to the Local Area Network. Mechanical department should develop preventive, predictive and corrective maintenance programs to achieve the goal of maintenance prevention..

2.2.6 Non-availability of Standard Operating Procedures

Standard Operating Procedures(SOP) is a set of clearly written down instructions that document any activity followed by lab in-charge and students. Clearly written down procedures ensure that the equipments are run properly and the probability of failure is minimal.

2.2.7 Tools and instruments

Department should invest in latest state-of-the-art tools and measuring instruments for faster identification and rectification of problems arising in experimental set-up. This will help in considerably reducing failures and breakdowns of equipments and machines.

2.2.8 Holding large inventory

In order to ensure that processes do not get affected due to unavailability of resources and raw materials, workshop hold enormous inventory leading to large holding and storage costs which adversely affects profits. Workshop should be done in a manner that the raw materials are available just-in-time for the process and completing the continually jobs of student. Also for the various equipment such as venturimeter and orificemeter, mercury is as an inventory.

III. PROPOSED METHODOLOGY [3]

The proposed methodology for developing TPM framework in engineering institute laboratories is as presented in fig. 1

The Mechanical Engineering department of RMCET is considered as case study to implement this TPM framework.

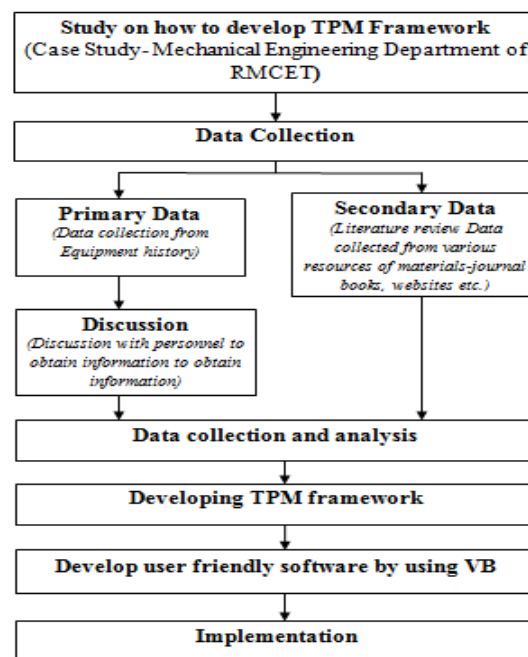


Fig. 1 Flow chart for methodology of the project

IV. DISCUSSION

The implementation of TPM in various industries is studied through literature review of research papers from reputed journals. By referring all the above mentioned papers we discussed about implementation methodology of TPM in our laboratories of mechanical engineering department. We decided to develop one user friendly software by using visual basic which will contain all TPM regarding information and which will help student as well as respective lab in-charge.

TPM implementation in engineering education institute is a new management paradigm; it is considered a dramatic change as compared to traditional maintenance system currently used in majority of mechanical department laboratories. However, this dramatic change requires a top management commitment and support. The proposed maintenance methodology suggests an increase in lab assistant as well as student responsibilities from using lab instruments to maintain them.

During the process of analyzing most frequent causes for failing instruments in laboratories before TPM implementation, lab assistant described errors as redundant due to lack of instruments care and preventive maintenance activities. Proposed TPM system gives the high priority to improve lab assistant abilities to accomplish small maintenance activities and upkeep their respective laboratories. Majority of these activities lies in the AM pillar which is a major concept in the TPM. It is possible because we are developing a software using Visual Basics which gives all maintenance related data to lab assistant.

In this paper, the presented methodology can be useful tool for guiding laboratory facilities to improve their maintenance operations. This is case of mechanical engineering department of RMCET and we are trying to put methodology for the implementation of TPM program in the mechanical engineering laboratories.

V. CONCLUSION

The following conclusion is derived from implementation of TPM in the laboratories of mechanical engineering department

1. This paper presents a review of literature in brief on improving precision in results with maintenance function in laboratory in mechanical department.
2. The success of TPM depends on effective implementation of TPM pillars.
3. The key factors for this implementation are lab assistants, lab in-charge, student involvement and top management support.
4. Also this paper suggests some barriers related to actual TPM implementation in engineering education institute.

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