

Total Productive Maintenance



Engineering

KEYWORDS: Total productive maintenance, Preventive maintenance, Critical success factors, Overall Equipment Effectiveness, etc.

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ABSTRACT

Manufacturing is considered to be an important element in a firm's endeavor to improve firm Performance. TPM is a highly structured approach, which uses a number of tools and techniques to achieve highly effective plants and machinery. A well conceived TPM implementation program not only improve the equipment efficiency and effectiveness but also brings appreciable improvements in other areas of the manufacturing enterprise. Total productive maintenance is one of the innovative approaches to maintenance that Optimizes equipment effectiveness eliminates breakdowns and promotes autonomous maintenance by operators through day-to-day activities involving total workforce. Thus TPM is maintenance activity that is productive and implemented by all employees.

1. INTRODUCTION:

TPM is a unique Japanese philosophy, which has been developed based on the productive maintenance concepts and methodologies. This concept was first introduced by M/s Nippon Denso Co. Ltd. of Japan, a supplier of M/s Toyota Motor Company, Japan in the year 1971. TPM involves everyone in the organization from operators to senior management in equipment improvement. It encompasses all departments' including- Maintenance, Operations, Facilities, Design Engineering, Project Engineering, and Construction Engineering, Inventory and Stores, Purchasing, Accounting and Finance, Plant and Site Management. The effectiveness of maintenance function significantly contributes towards the performance of equipment production and products. Thus TPM is defined as an innovative approach to maintenance that optimizes equipment effectiveness, eliminates breakdowns, and promotes autonomous maintenance by operators through day-to-day activities.

2. PILLORES OF TPM:

Based on Japan Institute of Plant Maintenance TPM program is based on the implementation of series 8 pillars of TPM in a systematic way to optimize plant and equipment efficiency by crating perfect relationship between man and equipment as shown in below figure 2.1.



Figure2.1: Pillars of TPM

3. Contributions Of TPM Towards Improving Manufacturing Performance: Generally speaking, the objective of equipment maintenance is to reduce the adverse effects of breakdown and to maximize the availability of facilities at a minimum cost, but maintenance is often considered as a secondary process in firms and the management has a view that it is as if a curse and its costs cannot be controlled. TPM is a highly structured approach, which uses a number of tools and techniques to achieve highly effective plants and machinery. With competition in manufacturing industries rising relentlessly, TPM has proved to be the maintenance improvement philosophy preventing the failure of an organization [2].

4. Implementation of TPM:

The major elements of its implementation in order are the un-

derstanding and development of awareness about TPM, identification and classification of problems, development of human resources and formation of small groups, collection of data on losses and flow of information, identification of engineering methods for their minimization, implementation of those methods and evaluation by statistical analysis and interpretation, documentation, and measures for further improvement. As shown in below figures 4.1.

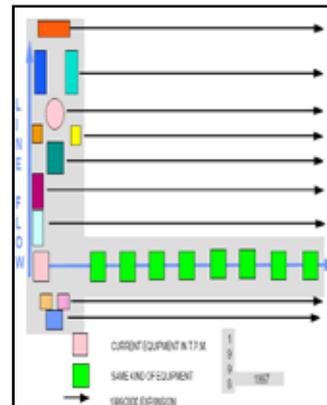


Figure 4.1: TPM Deployment

5. Development of TPM In An Organization:

The following steps are taken to Develop TPM in an organization [3].

- Preparatory stage:
- Introduction stage
- Implementation stag
- Stabilization stage

5.1 Overall Equipment Effectiveness: The Overall Equipment Effectiveness was originated from the Total Productive Maintenance practices, is define as "OEE is a result can be expressed as the ration of the actual output of the equipment divided by the maximum output of the equipment under the best performance condition" [6]. OEE Calculation: OEE is equal to the multiplication of the three main bases for the main six big losses-

1. Availability indicates the problem which caused by downtime losses.
 2. Performance indicates the losses caused by speed losses and
 3. Quality indicates the scrap and rework losses.
- OEE = Availability x Performance rate x Quality rate.

5.2 Methodologies in TPM: To analyze the data, one statistical technique was adopted. Structural equation modeling techniques was utilize to perform the require statistical analysis of

the data from the survey. Exploratory factor analysis, reliability analysis and confirmatory factor analysis to test for construct validity, reliability, and measurements loading were performed.

The statistical Package for the Social Sciences (SPSS) version 17 was used to analyze the preliminary data and provide descriptive standard deviations, and frequencies. Structural Equation Modeling (SEM using AMOS 6.0) will use to test the measurement model [8].

6. TPM CORE ACTIVITIES

- There are following eight core activities of TPM
- Equipment improvement / Focused improvement (KAI-ZEN)
- Autonomous maintenance (JISHU HOZEN)
- Early management (5S)
- Planned maintenance
- Quality maintenance
- Education and training
- Administrative and support department activity.
- Safety and environmental management.

7. Summary:

TPM is a production-driven improvement methodology that is designed to optimize equipment reliability and ensure efficient management of plant assets. TPM is a change philosophy, which has contributed significantly towards realization of significant improvements in the manufacturing organizations in the West and Japan. TPM has been depicted as a manufacturing strategy comprising of following steps [9]

- Maximizing equipment effectiveness through optimization of equipment availability, performance, efficiency and product quality.
- Establishing a preventive maintenance strategy for the entire life cycle of equipment.
- Covering all departments such as planning, user and maintenance departments.
- Involving all staff members from top management to shop-floor workers and
- Promoting improved maintenance through small-group autonomous activities.

8. Conclusion:

The contributions of various TPM implementations have initiatives for accruing strategic benefits for meeting the challenges posed by global competition. TPM has emerged as a key competitive strategy for business organizations in the global marketplace. An effective TPM implementation program can focus on addressing the organization's maintenance related problems, with a view to optimize equipment performance. TPM has become a new management paradigm in all types of organizations. TPM concepts and philosophy can be effectively employed to realize fundamental improvements of manufacturing performance in the organization, thereby leading the organizations successfully in the highly competitive environment. TPM can prove to be an effective global strategy for rendering firms a consistent enhancement of performance in terms of achieving strategic core competencies. Thus, in the highly competitive scenario, TPM might prove to be one amongst the best of the proactive strategic initiatives that can lead the organizations to scale new levels of achievements and could really make the difference between success and failure of the organizations.

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