

Emerging trends in total productive maintenance management essay



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The objective of this paper is to review the literature on Total Productive Maintenance and to present an overview of TPM implementation practices adopted by the manufacturing organizations particularly the automotive industry. It also aims to highlight appropriate enablers and success factors for successful TPM implementation.

Introduction:

The manufacturing industry has seen extreme changes in management approaches, product and process technologies, customer expectations, supplier attitudes as well as competitive behaviour. In today's highly changing environment, global competition among organizations has led to higher demands on the manufacturing organizations. The rapidly changing global marketplace necessitates for improvements in a company's performance by focusing on cost reduction, improving productivity, quality and ensuring deliveries in order to satisfy customers. Thus the organizations need to improve at a faster rate than their competitors, if they are to survive or grow in the marketplace. To meet the challenges put forth by the competitive environment, the manufacturing organizations must provide quality and performance improvement initiatives in all aspects of their operations to improve their competitiveness.

Total Productive Maintenance(TPM):

Total Productive Maintenance (TPM) is a unique Japanese philosophy which 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 is an innovative approach to maintenance that optimizes equipment effectiveness, eliminates breakdowns and promotes autonomous maintenance by operators through <https://assignbuster.com/emerging-trends-in-total-productive-maintenance-management-essay/>

day-to-day activities involving total workforce. TPM is a production-driven improvement methodology that is designed to optimize equipment reliability and ensure efficient management of plant assets through the use of employee involvement and empowerment, by connecting manufacturing, maintenance and engineering functions. TPM initiatives address major losses and wastes associated with the production systems by performing continuous and systematic evaluation of production system, thereby bringing about significant improvements in production facilities. The main goal of TPM is to bring vital maintenance related trades and production workers together. There are three ultimate goals of TPM:

zero defects,

zero accident,

zero breakdowns.

The manufacturing organizations in their quest of beating the competition in the demand-driven environments are increasingly adopting proactive strategies like TPM and total quality management (TQM) to achieve fast, focused, and sustainable results. TPM is an innovative approach to plant maintenance that is complementary to total quality management (TQM), just-in-time manufacturing (JIT), total employee involvement (TEI), continuous performance improvement (CPI), and other world-class manufacturing strategies. TPM is a relatively new and practical application of TQM and suggests that TPM aims to promote a culture in which operators develop “ownership” of their machines, learn more about them, and in the process develop skills to concentrate on problem solving and equipment

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improvement projects. TPM improves the competitiveness of an organization by providing enhanced equipment availability and utilization while optimizing the maintenance costs in the organizations. TPM enhances the competitive advantages of improved quality, improved delivery, and increased flexibility without excessive maintenance investments. TPM initiatives can also be effectively integrated with other manufacturing management programs like TQM, JIT, or Cellular Manufacturing to optimize improved performance, and ultimately competitiveness. The emergence of TPM is planned to bring both production and maintenance functions together by a combination of good working practices, team-working and continuous improvement. TPM can be defined as a partnership between the maintenance and production organizations to improve product quality, reduce waste, reduce manufacturing cost, increase equipment availability, and improve organization's overall state of maintenance. TPM permanently improves the overall effectiveness of equipment with the active involvement of operators. TPM has been widely recognized as a strategic weapon for improving manufacturing performance by enhancing the effectiveness of production facilities. TPM is maintenance improvement strategy that involves all employees in the organization and includes everyone from top management to the line employee, and it encompasses all departments including, maintenance, operations, design engineering, project engineering, inventory and stores, purchasing, accounting finances, plant management. TPM involves series of methods that ensures every piece of equipment in a production process is always able to perform its required task. TPM also links together all other maintenance and reliability programs together for a new business strategy that focuses on results and changes the work culture along <https://assignbuster.com/emerging-trends-in-total-productive-maintenance-management-essay/>

the way. TPM schedules maintenance as an integral part of the manufacturing process to increase equipment effectiveness, to minimize and eventually eliminate emergency and unscheduled maintenance. TPM comprises of a companywide equipment maintenance program that covers the entire equipment life cycle and requires participation by every employee. TPM harnesses the participation of all the employees to improve production equipment's availability, performance, quality, reliability, and safety. TPM involves the following steps

Maximizing equipment effectiveness through optimization of equipment availability.

Enhancing performance, efficiency and product quality.

Establishing a preventive maintenance strategy for the entire life cycle of equipment.

Involving all staff members from top management to shop-floor workers.

Promoting improved maintenance through small-group autonomous activities.

Need for TPM:

TPM harnesses the participation of all the employees to improve production equipment's availability, performance, quality, reliability, and safety. TPM endeavours to tap the “ hidden capacity” of unreliable and ineffective equipment. TPM capitalizes on proactive and progressive maintenance methodologies and calls upon the knowledge and cooperation of operators,

equipment vendors, engineering, and support personnel to optimize machine performance, thereby resulting in elimination of breakdowns, reduction of unscheduled and scheduled downtime, improved utilization, higher throughput, and better product quality. The principal features of TPM are the pursuits of economic efficiency or profitability, maintenance prevention, improving maintainability, the use of preventive maintenance, and total participation of all employees. The bottom-line achievements of successful TPM implementation initiatives in an organization include lower operating costs, longer equipment life and lower overall maintenance costs. Thus TPM can be described as a structured equipment-centric continuous improvement process that strives to optimize production effectiveness by identifying and eliminating equipment and production efficiency losses throughout the production system life cycle through active team-based participation of employees across all levels of the operational hierarchy. The following are some of the aspects that necessitate implementing TPM in the manufacturing industry

To become world class, satisfy global customers and achieve sustained organizational growth.

To achieving enhanced manufacturing flexibility objectives.

To improve organization's work culture and mindset.

To improve productivity and quality.

To tap significant cost reduction opportunity regarding maintenance related expenses.

To minimize investments in new technologies and maximizing return on investment ROI.

To ensure appropriate manufacturing quality and production quantities in JIT manufacturing environment.

To work smarter and not harder (improve employee productivity)

These are some of the reasons for the implementation of TPM in manufacturing industries. Although this is not an exhaustive list, it covers the essential reasons for the implementation of TPM. In addition TPM can also lead to the achievement of various organizational manufacturing priorities and goals such as

Priority

Impact

Productivity

Reduced unplanned stoppages and breakdown improving equipment availability and productivity.

Quality

Reduce failures through improved quality.

Cost

Reduce cost through eliminating waste.

Delivery

Improves efficiency of delivery, speed. and reliability.

Safety

Realizing zero accidents at workplace

Eliminates hazardous situations

Morale

Significant improvement in kaizen and suggestions

Increase employees' knowledge of the process and product

Improved problem-solving ability

Increase in worker skills and knowledge

Employee involvement and empowerment

(Source: I. P. S. Ahuja , et al, 2008)

Framework of TPM

TPM seeks to maximize equipment effectiveness throughout the lifetime of the equipment. It strives to maintain the equipment in optimum condition in order to prevent unexpected breakdown, speed losses, and quality defects occurring from activities. There are three ultimate goals of TPM:

zero defects,

zero accident,

zero breakdowns .

TPM has been seen as a comprehensive manufacturing strategy to improve equipment productivity. The strategy elements include cross-functional teams to eliminate barriers to machine uptime, rigorous preventive maintenance programs, improved maintenance operations management efficiency, equipment maintenance training to the lowest level, and information systems to support the development of imported equipment with lower cost and higher reliability. Total employee involvement, autonomous maintenance by operators, small group activities to improve equipment reliability, maintainability and productivity, and continuous improvement (kaizen) are the principles embraced by TPM. A TPM program typically enlarges the responsibility of production employees from merely operating machines to such areas as detecting machine failures, performing basic maintenance, and keeping work areas clean and organized. As TPM is a common element to the lean drive, it requires not only flexible equipment, but also flexible employees involved in the production process. The practices of TPM help eliminate waste arising from an unorganized work area, unplanned downtime, and machine performance variability. Like the concept of TQM, TPM is focused on improving all the big picture indicators of manufacturing success. TPM is very much about safety, asset utilization, expanding capacity without investment in new equipment or people and, of course, continuing to lower the cost of equipment maintenance and improve machine uptime. TPM implementation requires a long-term commitment to achieve the benefits of improved equipment effectiveness through training, management support, and teamwork. The core TPM initiatives are classified

into eight TPM pillars or activities for accomplishing the manufacturing performance excellence. These are as follows.

Initiative

Issues Addressed

Autonomous Maintenance

Developing operator ownership

Perform cleaning – lubricating – tightening – adjustment –

inspection – readjustment on production equipment

Focused Maintenance

Systematic identification and elimination of losses

Improved OEE on production systems

Planned Maintenance

Improving Mean Time Between Failure(MTBF) and Mean Time to

Repair(MTTR)

Quality Maintenance

Achieving zero defects

Education and training

Multi-skilling of employees

Safety, health and environment

Ensure safe working environment

Eliminate incidents of injuries and accidents

Provide standard operating procedures

Office TPM

Apply 5S in office and working areas

Development management

Utilize learning from existing systems to new systems

(Source: I. P. S. Ahuja , et al, 2008)

The key 5S activities involve

Seiri(Sort)

Seiton(Set in Order)

Seiso(Shine)

Seiketsu(Standardize)

Shitsuke(Sustain)

Implementation of TPM:

TPM is a highly structured approach and careful, thorough planning and preparation are keys to successful company-wide implementation of TPM

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and so is senior management's understanding and belief in the concept.

(Source : Rambabu Kodali, et al , 2009) One of the most significant elements of TPM implementation process is that, it is a consistent and repeatable methodology for continuous improvement. A driving consideration for TPM is the fact that successful TPM implementation takes from three to five years, with an average of three and a half years from introduction to achievement of TPM. The organizations across the world have been struggling since long to evolve the best possible strategy for successful implementation of TPM.

There are various ways and methods in which TPM can be implemented.

Some of them are highlighted here

Three Phase Implementation

Phase I: Improving equipment to its highest required level of performance and availability (focused improvement). This phase involves the following

Determine existing equipment performance and availability ;

Determine equipment condition;

Determine current maintenance performed on equipment;

Analyze equipment losses;

Develop and rank equipment improvement needs and opportunities;

Develop setup and changeover improvement needs and opportunities;

Execute improvement opportunities as planned and scheduled activity;

Check results and continue with improvement as required.

Phase II : Maintaining equipment at its highest required level of performance and

Availability(autonomous maintenance, planned maintenance, quality maintenance). This phase involves the following

Develop planned maintenance, cleaning, lubrication requirements for each machine;

Develop planned maintenance, cleaning, and lubrication procedures;

Execute planned maintenance, cleaning and lubrication as planned and scheduled activities;

Phase III: Establishing procedures to purchase new equipment and developing new processes with a defined level of high performance and low life cycle cost (maintenance prevention, quality maintenance). This phase involves the following

Develop engineering specifications;

Get feedback from production operations based on current equipment experience;

Get feedback from maintenance operations based on current equipment experience;

Eliminate past problems in new equipment and process technology design;

Design in diagnostic capabilities with new equipment and processes;

Start training on new equipment and processes early (prior to deployment);

Accept and deploy new equipment and processes only if they meet or exceed

Engineering specifications.

Five Pillar Model

TPM implementation process, at the highest level requires initialization, implementation, and institutionalization.

(Source: I. P. S. Ahuja , et al, 2008)

Success factors for TPM implementation:

TPM is a result of the corporate focus on making better use of available resources. TPM literature presents many success criteria for effective and systematic TPM implementation. In order to realize the true potential of TPM and ensure successful TPM implementation, TPM goals and objectives need to be fully integrated into the strategic and business plans of the organizations, because TPM affects the entire organization, and is not limited to production. The first course of action is to establish a strategic direction for TPM. The transition from a traditional maintenance program to TPM requires a significant shift in the way the production and maintenance functions operate. Rather than a set of instructions, TPM is a philosophy, the adoption of which requires a change of attitude by production and

maintenance personnel. There are four key components for successful implementation of TPM in an organization

worker training,

operator involvement,

teams and

preventive maintenance.

There is an utmost need to promote initiatives facilitating smooth TPM implementation that include committed leadership, strategic planning, cross-functional training, and employee involvement. In order to capture the TPM program completely, it is important to combine the TPM practices identified as pillars or elements of TPM with the TPM development activities. For TPM to be successful, the improvement processes must be recognized as benefiting both the organization and the workers. There is need to promote an environment for facilitating employees to smoothly implement the TPM techniques of autonomous and planned maintenance. One key strategy, in effective implementation of TPM workgroups is, management's support to drive continuous improvement in the team environment. Building on trust through effective communication, worker participation in decisions, acceptance of ideas, and frequent feedback are catalysts that drive improvement through strategic TPM implementing programs. Team Leadership must provide consistent messages, and should include encouragement, facilitating and maintaining order, and help with decision-making. The role of the worker needs to change from one that supports the

traditional craft mentality of maintaining specialized jobs, to one that allows greater flexibility. In addition, this new role necessitates removing age-old barriers in place since the inception of automated production. This effort requires an active organization. This requires competent leaders who are willing to invest in education and willing to empower the workforce. These developmental activities form a set of strategic and human resource oriented practices.

Contributions of TPM towards improving manufacturing performance:

Manufacturing is considered to be an important element in a firm's endeavour to improve firm performance. Superior manufacturing performance leads to competitiveness. (Source: R M Nachiappan, et al, 2009). 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 . Today, an effective Total Productive Maintenance strategy and programs are needed, which can cope with the dynamic needs and discover the hidden but unused or underutilized resources (human brainpower, man-hours, machine-hours). TPM methodology has the potential to meet the current demands. A well conceived TPM implementation program not only improves the equipment efficiency and effectiveness but also brings appreciable improvements in other areas of the manufacturing enterprise. A number of researchers and practitioners have evaluated the contributions of an effective TPM implementation program towards improving manufacturing

performance. The holistic deployment of an effective TPM implementation program can help the organizations to realize core competencies for sustainability efforts to meet global competition. An efficient TPM implementation program in today's highly competitive global marketplace could leave the firms, a consistent enhancement of core competencies like competitive and market related core competencies; strategic core competencies; technological core competencies; organizational core competencies; operational core competencies; and human resource core competencies. Strategic TPM initiatives have helped the struggling organizations across the globe to effectively compete in increasingly unstable and technologically complex markets. The cases of organizations having successfully implemented performance improvement initiatives based upon TPM are growing steadily all over the world. Thus, an effective TPM implementation program has huge potential to deliver improvements in the manufacturing performance and can ensure the survival and growth of an organization by harnessing various core competencies related to organization.

Benefits of TPM implementation:

TPM is a world-class approach, which involves everyone in the organization, working to increase equipment effectiveness. (Source: I. P. S. Ahuja , et al, 2008)

TPM implementation in an organization can ensure higher productivity, better quality, fewer breakdowns, lower costs, reliable deliveries, motivating working environments, enhanced safety and improved morale of the employees. The ultimate benefits that can be obtained by implementing TPM <https://assignbuster.com/emerging-trends-in-total-productive-maintenance-management-essay/>

are enhanced productivity and profitability of the organizations. TPM aims to increase the availability of existing equipment in a given situation, reducing in that way the need for further capital investment. Instrumental to its success is the investment in human resources, which further results in better hardware utilization, higher product quality and reduced labour costs. The literature documents dramatic tangible operational improvements resulting from successful TPM implementation programs. Companies practicing TPM invariably achieve startling results, particularly in reducing equipment breakdowns, minimizing idling and minor stops, lessening quality defects and claims, boosting productivity, trimming labour and costs, shrinking inventory, cutting accidents, and promoting employee involvement. When the breakdowns and defects are eliminated, many benefits are presented: equipment productivity improvement, cost reduction, quality improvement, and inventory reduction, etc. The TPM approach helps increase uptime of equipment, reduce machinery set-up time, enhance quality, and lower costs. Through this approach, maintenance becomes an integral part of the team. The ultimate benefits obtained by implementing TPM are increased profitability and improved productivity. After successful TPM implementation, some cases show that companies achieved 15-30 per cent reduction in maintenance cost, while others revealed a 90 per cent reduction in process defects and 40-50 per cent increase in labour productivity. Also, some Japanese companies that have applied major TPM programs have seen a general increase in equipment productivity of 40-50 per cent.

Challenges in TPM implementation:

Some of the major problems in TPM implementation include cultural resistance to change, partial implementation of TPM, overly optimistic expectations, lack of training and education and lack of organizational commitment. It has been reported in the literature that TPM implementation is not an easy task by any means. The number of companies successfully implementing TPM program is considered relatively small. While there are several success stories and research on TPM, there are also documented cases of failure in the implementation of TPM programs in different situations. TPM demands not only commitments, but also structure and direction. Some of the prominent problems in TPM implementation include cultural resistance to change, partial implementation of TPM, overly optimistic expectations, lack of a well-defined routine for attaining the objectives of implementation (equipment effectiveness), lack of training and education, lack of organizational communication, and implementation of TPM to conform to societal norms rather than for its instrumentality to achieve world class manufacturing. The failure of organizations to successfully institutionalize effective TPM implementation program is due to lack of a support system to facilitate learning and transform learning into effective diffusion of the practices of TPM. The failure of the organizations to successfully harness the true potential of TPM can also be attributed to confusion over what exactly constitutes TPM, lack of management consensus, underestimating the importance of knowledge, inconsistent and unclear expectations, neglecting the basics, and TPM implementation within an existing organization structure that does not provide the necessary support. These problems reflect the lack of a clear understanding of what are

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the fundamental and complementary manufacturing practices. It has been observed that companies that have experienced failure in the TPM implementation programs have often neglected the development of basic practices continuous improvement, total employee involvement, cross functional teams, that support the implementation of TPM techniques.

Conclusion:

The study highlights the contributions of various TPM implementation 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. In recent years, many organizations have demonstrated that significant improvements in business can be achieved through TPM. 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. The study validates the relevance of strategic TPM initiatives into the manufacturing

strategy for realization of organizational objectives in the successful organizations. The study clearly reveals that the successful TPM implementation program can facilitate the manufacturing organization's quest for achieving enhanced manufacturing performance leading to competitive advantage.