A Review on Implementation of Total Productive Maintenance in Industries

Gaurav S. Bharambey¹ Rahul K. Bavane²
¹²BE Student ²Assistant Professor
¹²Department of Mechanical Engineering
¹Pimpri Chinchwad College of Engineering & Research, Ravet, Pune, (M.S) India

Abstract—Total productive maintenance is a very important aspect and a tool which is used by many of the manufacturing industries so as to improve the Overall Equipment Effectiveness, reducing losses as well as costs, improving productivity etc. The main objective of this paper is to review the literature of TPM in manufacturing industries and its implementation and to get an idea about how it is applied in different industries and their growth in terms of World Class Manufacturing. The method used is the studying of number of case studies and review papers which deals with the TPM and its implementation in the manufacturing sectors. The results which are obtained by this analysis is that TPM is a highly beneficial process when it comes to manufacturing industries even with the presence of some minor shortcomings. It can be concluded from this paper that implementation of TPM has more advantages than the shortcomings thus it is a very favorable and recommended program.

Key words: Total Productive Maintenance (TPM), World Class Manufacturing (WCM), Overall Equipment Effectiveness (OEE)

I. INTRODUCTION

For getting successful in this competitive world, one has to perform at its very best every time, be it the teamwork of your workforce or the machines; everything should be in top of the class condition for best results. This is what are the requirements of manufacturing industries and this type of ideology is one of the major reasons why TPM is emphasized & adapted by manufacturing industries. The main aim of any industry or manufacturing organization should be to achieve World Class Manufacturing, in which TPM plays an important role.

TPM is considered by the manufacturing industries because of the reason that for continuous growth and enhancement one can only do so much with the improvement in the machines they have been provided and therefore a need for further improvement can be achieved with smart utilization of the machine and the World Class Manufacturing level can be achieved and therefore implementation of TPM is necessary to compete in the market.

TPM is often considered as “Medical Science of Equipment”.

TPM is basically a system of improving and maintaining production and quality systems through the equipments, processes and employees. It mainly concentrates on keeping all the machines in top notch working condition to avoid any breakdowns and delays in manufacturing. Due to TPM “Sense of Ownership” is developed in all the personnel connected to a particular machine, equipment or process. All personnel take part in this process including machine operator, machine supervisor etc.

TPM is a holistic approach for equipment maintenance that strives to achieve perfect production and to form a safe working environment for all personnel.

TPM is implemented in industries with the help of the following TPM pillars, which gives a particular direction to the implementer for how to achieve a particular goal.

A. TPM Pillar

The TPM pillars are basically a route map or guideline for implementation of TPM in any manufacturing industry. There are basically 8 TPM pillars which stand on a base. Therefore to start implementing the TPM pillars one must fulfill the prerequisite of the foundation first and then only one can start moving forward with the TPM pillars and achieve the reputed world class manufacturing level. The foundation of TPM is “5S”. The foundation “5S” is explained the table as follows;

<table>
<thead>
<tr>
<th>Japanese Term</th>
<th>Literal English Translation</th>
<th>Equivalent English Terms</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seiri</td>
<td>Organization</td>
<td>Sort Out</td>
<td>Sorting of all items in work place</td>
</tr>
<tr>
<td>Seiton</td>
<td>Tidiness</td>
<td>Systematize or set in order</td>
<td>Arranging all items in systematic manner for easy selection when in use</td>
</tr>
<tr>
<td>Seisso</td>
<td>Cleaning</td>
<td>Shine or Sweep</td>
<td>Workplace is kept clean free from any scraps.</td>
</tr>
<tr>
<td>Seiketsu</td>
<td>Standardization</td>
<td>Standardize</td>
<td>Standards should be set &amp; maintained</td>
</tr>
<tr>
<td>Shitsuke</td>
<td>Discipline</td>
<td>Sustain or self discipline</td>
<td>Standard work procedures are to be followed and sustain.</td>
</tr>
</tbody>
</table>

Following this “5S” rule, the pillars are followed step by step. The table below gives an overview on TPM pillars.

<table>
<thead>
<tr>
<th>TPM Pillar</th>
<th>Description</th>
<th>Advantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Autonomous Maintenance (Jishu Hozen)</td>
<td>It aims towards developing operators to be able to take care of</td>
<td>A sense of responsibility is inculcated &amp; reliability of equipment increases</td>
</tr>
</tbody>
</table>
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Kobetsu Kaizen (Focused improvement) A large number of small improvements are more effective than small number of bigger value improvements Problems solving capabilities in worker is elevated

Planned Maintenance Maintenance activities are scheduled using previous machine failure data Maintenance activities can be scheduled when production is less

Quality maintenance Customer satisfaction through delivery of highest quality product as well as product free from defects. Decrease in defective products and increase in profits of company

Education & Training Bridging the skills and knowledge gap by training of all the workers in the organization. It helps all the personnel to gain the skills and solve the basic problems on their own

Office TPM Passing all the principles to all the administrative function in the organization. The support element in the organization understands the advantages of the improvements in the organization.

Safety, Health & Environment Ideal working space is created by eliminating all the hazardous factors and trying to achieve zero accidents. Elimination of harmful conditions and achievement of healthy workforce

II. LITERATURE REVIEW

The following literature review is developed by considering different research and review papers of different years:

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Name of Authors</th>
<th>Name of Topic</th>
<th>Publications</th>
<th>Year</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Meghraj, Dr. Sridhar K</td>
<td>Implementing Total Productive Maintenance in Machine shop of Manufacturing Industry--A Case Study</td>
<td>International Journal of Darshan Institute on Engineering Research &amp; Emerging Technologies</td>
<td>2016</td>
<td>The correlations between various TPM implementation factors and manufacturing performance improvements have been evaluated and validated by employing overall equipment effectiveness (OEE) in the machine shop.</td>
</tr>
<tr>
<td>2.</td>
<td>Sethia, Chetan S, Prof. Shende, P. N., and Dange, Swapnil S.</td>
<td>A Case Study on Total Productive Maintenance in Rolling Mill</td>
<td>Journal of Emerging Technologies and Innovative Research (JETIR)</td>
<td>2014</td>
<td>The availability, Overall Equipment Effectiveness, performance rate, quality rate is observed and found not up to the level of world class measurements therefore TPM implementation is important for the rolling mill plant.</td>
</tr>
<tr>
<td>4.</td>
<td>Ahuja, I.P.S. and Kumar, Pankaj</td>
<td>A case study of total productive maintenance implementation at precision tube mills</td>
<td>Journal of Quality in Maintenance Engineering, Emerald Group Publishing Limited</td>
<td>2009</td>
<td>TPM is far more advantageous &amp; beneficial than the other maintenance practices and correct implementation results in improvement in manufacturing performance.</td>
</tr>
<tr>
<td>5.</td>
<td>Dogra Manu, Sharma, Vishal S., Sachdeva, Anish, and Dureja, J.S.</td>
<td>TPM- a key strategy for productivity improvement in process industry</td>
<td>Journal of Engineering Science and Technology</td>
<td>2011</td>
<td>Better communication was observed among the different department personnel, cost was reduced, and increases in OEE, accidents were also reduced.</td>
</tr>
<tr>
<td>6.</td>
<td>Panneerselvam, Murugadoss K</td>
<td>TPM implementation to invigorate manufacturing performance: an Indian industrial rubric</td>
<td>International Journal of Scientific &amp; Engineering Research</td>
<td>2012</td>
<td>TPM cannot be implemented overnight; it requires time to be implemented. Small projects are very helpful in implementing TPM; also patience is must by the top management committee.</td>
</tr>
<tr>
<td>7.</td>
<td>Wakjira, Melesse</td>
<td>Total Productive</td>
<td>Global Journal of</td>
<td>2012</td>
<td>In a time frame of few months,</td>
</tr>
</tbody>
</table>
III. RESULTS & FINDINGS

The study shows that there are some problems while the implementation of TPM in an manufacturing industry like initial cost of TPM, team setup takes longer time and the most important is the change in the mindset of the personnel of the organization are some of the barriers of the TPM but once if they are overcome then the resulting advantages are much higher than its barriers. Concepts like Zero Defects, Zero Breakdowns, and Zero Accidents are followed throughout the TPM. Higher morale of the workers can also be observed.

The study also shows a increase in the growth of OEE of the equipment, wherever it is applicable, it helps to improve the availability, performance rate, quality rate of the equipment and also boosts the morale of the employees, healthy inter-departmental communications and also reduction of downtime, reduced repair rework cost, reduced maintenance cost as well as improved productivity etc. These are some of the results of a successfully implemented TPM in a manufacturing industry. All of this helps the organization to reach the level of World Class Manufacturing title, a necessity in today’s competitive manufacturing industries.

Also, it can be noted that increase in OEE is not an overnight task, the longer the TPM is practiced the better are the results of the industry. TPM can also be implemented by only focusing on the employees and utilizing them to their fullest potential and focusing on all the pillars of TPM and following them correctly.

IV. CONCLUSIONS

By considering all the advantages and barriers of TPM it can be seen that although it takes a lot of time to be implemented and run properly and also it takes constant attention but once implemented successfully, TPM can very advantageous in nature.

The Manufacturing industries where TPM is not implemented fully, can implement some of the pillars of TPM for improvement in their performance.

TPM is a lifelong process; it doesn’t stop at any point of time and goes on, continuously improving the performance of different aspects of the industry. It also increases the morale of the employees.

All the above points helps the organization to achieve the reputed title of world class manufacturing.

Thus, it can be concluded that, even with the presence of minor barriers on the way of implementing TPM, the advantages of TPM is much higher than its shortcomings and since TPM helps the manufacturing industries to acquire world class manufacturing level it should be considered as favorable program and should be recommended to be applied in all the manufacturing industries for competing in the present manufacturing market.

REFERENCES


