

# Review on Productivity improvement by Lean tools in manufacturing sector

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**Abstract**— Nowadays, every manufacturing industries focus on their productivity. Improvement in process and methods directly lead increase in productivity. By implementing Total productivity maintenance, the overall equipment efficiency of the machine improves which directly increase the production rate. Different lean tools like kaizen, poka yoke, kaizen, TPM, OEE, SMED, Value stream mapping, helps in the improvement and increase in the productivity. Non value activities decreased by lean tools and a standardize process and method has been developed. TPM helps in improving and maintaining production system through machine, process, and employee which add a positive value to the organization. The applicability of different techniques and lean tools for the productivity increase of CNC machine is analyses by this paper.

**Keywords**—Productivity, Lean tools, Total productivity maintenances, Single minute exchange of dies, Overall equipment efficiency;

## I. INTRODUCTION

In today's world lean tools becomes a weapon for increasing and improvement in the production system. Effective and efficient utilization of man, machine and resources is done by lean tools. The systematic elimination of non-value added activities from the production process is the primary focus on the lean production system. TPM is a technique and lean tool which helps in maintaining and improving production system through machine, process, and employee which add a positive value to the industries. OEE is used as a measure of TPM. OEE is the most important tool for the measuring and analysis of equipment performances. With the help of OEE all the major losses are covered. SMED is used for the reduction of the setup time and tool changeover time. The reason for the small and minor losses and wastes is known from the cause and effect diagram.

## II. Literature review of various tools and techniques to increase productivity

### (1) Lean tools

Lean play an important role in industrial environment. Firms that have effectively decreased their inside waste through lean generation techniques additionally actualize rehearses for better natural administration.

P. Arunagiri et al [1] describes 30 lean tools in his work and mainly focus on the reduction of the non-value activities by lean tools. The different lean tool taken are Total Productive Maintenance, 5S, OEE, Setup Time Reduction, 8 step Practical Problem Solving(PPS) Method, Pareto Analysis, Elimination of Waste, Kaizen , Line Balancing , Value Stream Mapping (VSM), Kaizen , SPC / Control Charting, Process Mapping , Autonomation, Continuous Improvement, Continuous Flow, Visual Controls, Six Sigma, Cellular Manufacturing , KANBAN, 5 Whys, Line Balancing, Voice Of The Customer, ANOVA, Work Standardization, Work Simplification, Fishbone diagrams, Six Sigma, Takt Time, QFD and Poke Yoke. Out of these 30 tools, the high effect

lean tools are to be discovered by utilizing the weighted moving average.

Utilizing the weighted moving average, investigation completed and the outcomes recommends that main 5 lean tools out of 30 tools are exceedingly powerful. His work concludes that utilization of any one among the five tools for example, 5S, Overall Equipment Effectiveness, 8 Step Problem Solving Methodology, Pareto analysis, elimination of wastes have a positive effect towards the profitability of the automobile company.

### (2) Single minute exchange of Dies (SMED)

SMED is a lean tool for the elimination of the Non value activities from the manufacturing process and form a standard time for setup of tools. The goal of the SMED for the setup time or tool changing time is to be done in 10 minutes. Shashikant Shinde et al [2] works on the implementation of SMED that describes the improvement in the set-up time process of a straightening cell on Axle Beam line. His works on to reduce the setup time, The SMED methodology and other Lean Production tools like 5S, Visual Management, Kaizen and Standard Work were applied. They Studying the Production process flow identification of bottleneck, set-up time and standard operation procedure. Reduction of the non-value activities and the convert of external activities into internal activities of production process were done.

M.Brito et al [3] works to reduce the setup time and improve ergonomics condition at the same time. The initial step was the decision of a multi useful group, including administrators, operators, to break down the procedures of the creation zone and assess the underlying circumstance as far as ergonomic conditions and efficiency. Concerning conditions, the group picked a postural investigation framework - Rapid Entire Body Assessment (REBA) - to evaluate the dimension of MSDs hazard since it give a scoring framework to muscle movement caused by static, dynamic, fast changing , that fits well to the contextual analysis.

### (3) Total productivity maintenance (TPM)

Melesse Workneh Wakjira et al [4] works on the implementation of the TPM in Boiler plant. The connections between's different TPM usage measurements and assembling execution upgrades have been assessed and approved by utilizing by Overall Equipment Effectiveness in boiler plant. Implementing the stages of TPM and considering the OEE for the measure of effectiveness. Implementation of TPM results increase in equipment availability, decrease in rework, rejection and increase in rate of performance as a result overall productivity of industry also increased.

Chetan S Sethia et al [5] focusing on the TPM and measuring technique of OEE that can improved equipment reliability, maintainability and productivity. His paper focusing on calculating the overall equipment effectiveness in Rolling Mill, and discuss the big six losses in any industry.

Vinayak Suryawanshi et al [6] points the effectiveness and implementation of TPM program in a manufacturing organization. Implementation of TPM results in the increase the OEE of the machine. The process of TPM is applied on the Wire cut CNC machine (Robofill-240SL).

Subhankur Dutta et al [7] studies the Overall Equipment Effectiveness in various machines and its improvement scheme through TPM implementation in the machines. Different lean tools like Initial cleaning, cleaning with Meaning, Why-Why analysis, Fishbone cause effect diagram analysis, Kaizen analysis, Pokayoke analysis, Jishu-Hozen analysis became the backbone of OEE improvement strategy for all the analysts in the implementation of TPM. Rishav Arora et al [8] works on the implementation of TPM method encourages us in keeping up and enhancing creation framework through machine, process, and worker which increase the value of the association and also the OEE increases. They implement TPM in TMT Bar in the Rolling processing plant industry.

### (4) Overall equipment effectiveness (OEE)

Aditya Sinhal et al [9] shows how improve the machine shop Overall Equipment Effectiveness by identifying wastes and providing solution to reduce or eliminate them from machine. Using parato charts, cause and effect diagram and SMED on machine for the elimination and identification of NVA.

Perumal Puvanasvaran et al [10] works on the Overall Equipment Effectiveness (OEE) with the consideration of both machine utilization and customer demand requested. Takt time, average cycle time, performance ratio, Availability were also taken in consideration for the OEE.

Vijay Lahri et al [11] points on OEE is a route map to boost the effectiveness and efficiency of manufacturing process and equipment. They mainly focus on loading time, Job setting, machining and machine utilization.

### (5) Setup Reduction

Patel Chintan Kumar[12] focuses on productivity

improvement of Computer Numerical Control (CNC) and reduce the NVA during the setup time.

Implementation of SMED the waste is reduce which results in the decrease of the setup time of the machine.

H.N.Reddappa et al [13] works for the reduction of process cycle time in CNC machines manufacturing industry. Decrease in process duration impacts in lower fabricating rate, higher yield and better potential given apparatus stock what's more, office limitations. His paper describes the importance and use of VSM technique to reduce cycle time in the CNC machine for the manufacturing of structural components.

### III. Conclusion

Factors which effect the decrease in the productivity are Setup time, Non value added activities, Seven wastes, Breakdown of Machine, Unplanned downtime, Improper management, Inefficient method of manufacturing, Material handling. There are different tools and techniques are available to reduce the above factors:

- SMED reduced the setup time which is the major loss in the manufacturing company.
- 5 why analysis is used to find out the root causes of the problem.
- OEE is the most important tool for the measuring and analysis of equipment performances. With the help of OEE all the major losses are covered.
- TPM is a technique and lean tool which helps us in maintaining and improving production system through machine, process, and employee which add a positive value to the organization. OEE is used as a measure of TPM.

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