Review of Lean Manufacturing Effectiveness on Industries

Bhavin R. Panchal[1], Snehal Trivedi[2], Prashant Khanna[3]

Department of Mechanical Engineering

Parul Institute of Technology, Vadodara, Gujarat, India

Email: *bhavinpanchal1998@gmail.com[1],snehal.trivedi@paruluniversity.ac.in[2], prashant.khanna8747@paruluniversity.ac.in[3]*

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Abstract

In a competitive industrial scenario, lean manufacturing is much effective in every industry. Lean manufacturing has various forms as lean management, lean production. It is a very effective technique for overcoming non-value-added activity as well as time. Lean manufacturing is also helping full to reduce waste. Waste in the form of a non-value-added exercise and poor quality of the product. Waste are seven types in industry transport, inventory, motion, waiting, overproduction, over-processing, defect. It is eliminated with the help of lean manufacturing. It is a system that gives the production of goods/services with minimum total costs. This paper provides the literature survey on the industries to apply lean manufacturing to the automobile industry, pharmaceutical companies, oil industry, and other manufacturing industries. Also, refer to other papers that give information about lean manufacturing—and introducing lean.

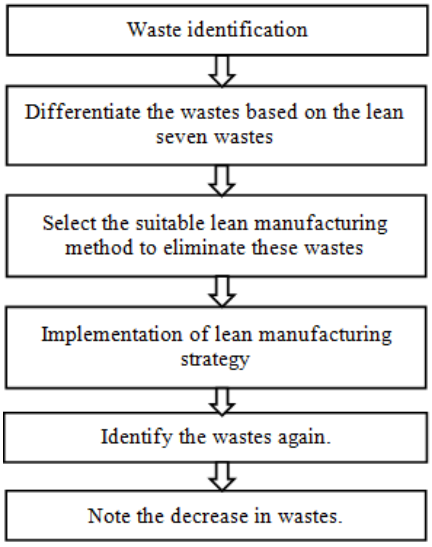
Keywords: - *machine ideal time analysis, 5S, SMED, process layout optimisation*

INTRODUCTION

In today's industrial scenario, huge losses/wastage occur in the manufacturing units. This waste is due to operators, lack of preventive maintenance, process flow, tooling problems, non-availability of components in time, etc. Other varieties of waste are the seven wastes of lean- Motion, Inventory, Waiting, Defects, Overproduction, Transportation, Over-processing, and others like idle machines, idle manpower, break down of machines, rejected parts, etc. of waste. This can be minimised by applying the concept and tools of lean like 5S, kaizen, TPM, poka-yoke, SMED, and the systematic layout planning for Enhanced productivity and higher product outputs at the scheduled or at a shorter cycle time. Obtaining a good layout at installation instead of a poor layout will save a lot of capital investment and production costs. Lean manufacturing is a technique that helps in continuous improvement, eliminates waste or NVA activities, and increases the organisation's quality and productivity. 5S helps in various ways in the improvement of the organisation. '5S' comes from five activities that begin with the letter'S' — Seiri, Seiton, Seiso, Seiketsu, and Shitsuke, which are Japanese words. The English equivalent of 5

'S's are Sort, Set in Order, Shining, Standardise, and Sustain. Single minute exchange of dies (SMED) is introduced by Shigeo Shingo that emphasises reducing the changeover time to less than 10 minutes or more specifically in a single-digit time and increases productivity.

How to address the waste?



LITERATURE REVIEW

Dilshad Guzel et al. [1] applied SMED methodology using 5S and Kaizen techniques, the average 50% improvement in changeover steps and 60% in setup times is observed. Also, Ergonomics improvement is achieved by categorising cutting tools in the tool cabinet by sorting them from the most frequently used to least-useable ones. And the result of this study was making a special cutting tool holder cabinet that allows us to categorise these tools near the machines for reaching the right tools quickly.

Prafulla C. et al. [2] applied SMED on the 200-Ton press machine because the productivity of this machine is a bottleneck. Based on the Plan-Do-Check-Act approach of TQM. They achieve a 45% reduction in setup changeover time and increased productivity by 55 units per setup.

I Rizkya et al. [3] Presented the Method of reducing search activity and space is given in this paper. In the welding workshop, by implementing the 5s, a reduction of search time by 18.75% and space optimisation by 11.20% is observed. Also, able to handle waste material problems, work environment, more time to search for documents, equipment, and stationery.

R. Amitkumar Dhanjibhai Makwana et al. [4] discussed a plastic machinery manufacturing company by applying 5S tool they get a reduction in search time of the material 8.6 hours to 3.1 hours also increases productivity level 75% to 80% Also several benefits like proper utilisation of space, clean work environment, prevent loss of items, tools, parts, high morale of employees, discipline, better communication, reduces the repetitive mistake by error proofing.

Peter Mårdberga et al. [5] The layout tool is tested at a relevant industrial test case that includes four CNC machines, a control station, a computer station, a washing station, and a tool service station.

Ranjith R Hombal et al. [6] discussed using the CRAFT algorithm to reduce travelling routes and transportation costs. The layout is designed according to frequently manufactured products. The new layout saves 21.1% compared to the original layout.

Rajkumar Sharma1 et al. [7] Carried out this research in a Gears manufacturing company. Observation is based on the machine operator that they face issuing in time material and tools to conduct smooth, fast, and continuous working to achieve higher productivity. After solving the problem, they get availability increases by 21.5%.

Quality improves by 0.81%, and downtimes are reduced.

Shubham Barnwal et al. [8] presented a study on the ongoing engine reconditioning process. The layout of the automobile industry is studied, and a new layout is developed based on the systematic layout planning pattern theory to reduce engine restore cost and increase productivity since it is an automobile assembly plant. Using the SLP method, the production rate is increased by 28%. Total distance travel came down to 14%. The new layout improves unit cost and distance travel.

AshishDhankhar et al. [9] analysed and identified factors that affect the assembly line efficiency based on the case study of a shock-absorber assembly line. The cycle time is reduced to 9.2s from 10.1s, and the line efficiency is improved by 69.63% to 71.27%.

Rushikesh Gavali1 et al. [10] Applied the SMED tool in the forging industry on a 1000 TP press machine. Analysis and data collection also help with the identification of a bottleneck. After solving and implementing the SMED, the reduction in setup time is achieved by 18.03%, and the setup time is reduced by 27 minutes.

Mr. Sujay Biswas et al. [11] shows the utilisation of Poka-Yoke for the development of SMEs. In this paper, small Manufacturing Enterprises units have been observed. The worker's skills are noted, and the interaction with the hierarchy of the production unit is also done. In this way, the leading cause of mistake-proofing is observed for the SME.

Juthamas Choomlucksanaa et al. [12] identified the problems in the deburring process by using the fishbone diagram to make that process efficient. Lean tools such as kaizen, 5S, visual control, and poka-yoke are applied, and they get 66.53% of the reduction in motion waste, and for making these reductions, sustainable kaizen plays a vital role.

Mohammed Viqar Nadaf Pinjar et al. [13] have worked on reducing the setup time of the gear hobbing machines by using SMED technics. By measuring the time taken by the operator to change the setup of the gear-hobbing machine and convert internal activity and by controlling the non-value-added activity, the reduction in the setup time is observed --22.18%.

A. R. AB Kadir et al. [14] Presented a focus on identifying the production efficiency of the current "Front of Line" production layout model by analysing the effectiveness of the existing production layout. The wastes in the bottleneck will be minimised by applying the lean tool in the new production layout model. Three conditions in time standard that was applied in this methodology---(1) A qualified, well-trained operator (2) Normal pace (3) Specific task.

Vipan Kumar et al. [15] discussed that the SMED technique is enforced on three mechanical press machines and calculated the setup time before and when enforced SMED. During which 1st they use 5'S technique, and so classify the interior and external got winded of to convert internal to external setup and streamlining all aspects of setup operation and realise the all the basic causes of high setup timed by victimisation cause and impact diagram (fishbone) found that total setup time of 3 machines before SMED enforced was 265 minutes and when SMED enforced was 196 minutes. Minutes saved in setup time was sixty-nine minutes.

Yosra Ojaghi et al. [16] applied two techniques, SLP and GBT, employed for plant layout. Six layouts of area units are generated from this method. Layout with higher potency is chosen, and so, it's changed.

Patriarch Zhang. [17] discussed advances in the Poka-Yoke theory by form alising the data system style as a replacement means of style for Poka-Yoke through multiple case studies. Its application in non-production processes is incredibly restricted because it relies on physical options for error detection. Supported analysis paper, the study results, this paper presents a theoretical framework to unify developments within the style for Poka-Yoke.

Dinesh B et al. [18] discussed that the Lean tool 5S was employed to develop a plant layout. Use 5S methodology to develop a layout with a clean atmosphere, during which everything ought to have its place. Everything ought to be in the situation. Information collected included victimisation material flow, department & machine space, operation & activity chart. The new layout is projected.

Eric Costa et al. [19] presented an associate application of the only Minute Exchange of Die (SMED) methodology to a turret punching machine in the associate elevators' company. Significant enhancements, specifically reductions of sixty-fourth within the setup time, five hundredth in WIP, and ninety-nine within the travelled distance. The implementation was conducted in step with a 9-step methodology projected by the authors and resorted to the standard SMED technique.

Bobby John et al. [20] discussed that the computerised Relative Allocation of facilities Technique (CRAFT) is employed for the reallocation. When choosing the most effective block layout, an elaborated layout is made, and this elaborated layout is analysed as a victimisation ARENA. An analysis is done with the appearance of computer code that allowed the user to make models and move them around the screen. Re-layout may also be done until a satisfactory result is obtained.

Rameshwar Singh et al. [21] presented that the TPM area unit was enforced in an exceedingly phased manner eliminating the losses and enabling the use of CNC machines that made an automotive element. The 5S audit studied the work. The victimisation check sheets and ratings were calculated. The success of TPM depends on varied pillars like 5-S, Jishu Hozen, Planned Maintenance, Quality maintenance, Kaizen, workplace TPM, and Safety, Health & atmosphere OEE has improved from sixty-three to seventy-nine.

Eric Costa et al. [22] applied the stepwise implementation of SMED. By reducing the operators' movement, the internal setup, and the external setup of a machine within the metal-mechanic space of elevators' company. Conjointly the reduction in search time of the die, some setup area unit performs on the machine when it stops, thus changing the interior setup to external, enhancements obtained within the setup time----65%, sixty-seven and fifty-three and enhancements brought in the distance travelled -----78%,55%, 45%.

Tarcisio Abreu et al. [23] analysed that paper introduction of a framework for assessing poka-

yoke devices. The framework is for the planning, operation, and maintenance processes of the Poka-yoke device instead of the outcomes of those processes. There are four methods. 2 of them worrying about quality and two about safety.

Arun patriarch et al. [24] applied SMED on press search that employed BMS press to assemble Hose clamps on Schwas primarily based MNC Company. Analytical scrutiny allowed the different tools to discern details of BMS Machine Bottleneck Identification of Internal and External Activities. They achieved BMS presses increased from sixty,000 to 1,05,000 clamps/day.

M. Dudek- Burlikowska et al. [25] analysed that a replacement approach for the implementation of quality philosophy Zero Quality Defects with the usage of the Poka-Yoke methodology within the polish organisation has been shown It shows that and implement All the principles of Poka-Yoke employed in the businesses connected with continuous improvement cycle PDCA.

Gang Xu et al. [26] discussed Coordinate and dimension of the apparatus area unit used as an answer for improvement. The solution is tested in many varieties for the most effective one. The computerised result's a roaring succeeds good result.

FINDING FROM LITERATURE REVIEW:

From the review of the published work related to the application of Lean Manufacturing Effectiveness on Industries and some technical approaches. It is observed,

The effective optimisation of the plant layout is like systematic layout planning, which is manually done(SLP), Computerized Relative Allocation of Facilities Technique(CRAFT), and graph-based theory(GBT).

SMED techniques are used to overcome the die change time, reducing in a single digit(1 to 9)minutes.

5S is the foundation of lean manufacturing.

Also, for the 5S, there are different solutions for space optimisation, work environment, handling of waste material.

CONCLUSIONS

The following significant conclusions are drawn from the review of the effectiveness of lean manufacturing concepts in the industry to improve manufacturing fields:

Most work targets improvement shown by implementing lean concepts. Improvement of the layouts, resolving bottleneck created by wastes, reducing the non-value added activities by different lean tools like 5s, systematic layout change, TQM, and some other tools like SMED and Poka-yoke can help improve the process.

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