

Analysis Of Factors Affecting Implementation Of Lean Manufacturing In Sme's Of India

Prathamesh Pawshe¹, Atul Rupnar², Anoopkumar Singh³, Kalyani Singh⁴

^{1, 2, 3, 4} Dept of Mechanical Engineering

^{1, 2, 3, 4} DMCE, Navi Mumbai, India.

Abstract- Today, in the era of competitive environment, every company tries to grow rapidly and keep up their prestige in market. To achieve it, industries always look for invention or tool which improves the production rate of their firm. Lean manufacturing is also one of concept or philosophy which is accepted universally due to its benefits to the organization. In this paper we are going to identify and analyze the barriers encountered while implementation of lean manufacturing in SME's of India by using questionnaire based survey analysis. The post analysis result gives the solutions which will help to reduce or eliminate the effectiveness of barriers of lean manufacturing.

Keywords- Lean manufacturing, Mean Analysis, Questionnaire Survey, Small and Medium Scale Industries (SME's).

I. INTRODUCTION

Manufacturing sector contributes 17% GDP in total GDP of India. According to Small and Medium Business Development Chamber of India, SME's currently contribute 45% of total national industrial output, in that 40% is exported. SME's forms 90% of total industrial units in India. From all these calculations it is clear that business competition of SME's is tough in India and also to sustain in market quality of product should be maintained. India is the fastest growing economy in the world, the scope of invention of production and quality improvement techniques is more. Also, due to customer driven market, LM becomes a need for organization to strive in a market. LM is not a new concept in India, but due to some myth about LM, still it is not well implemented in India as compared to other developed nations. The concept of LM arrived in India in the mid 1980's from Japan, which is the origin of the LM.

Nowadays, every industry tries to implement various quality improvement tools and techniques. Since quality of product and customer satisfaction are main concerns or aim of any manufacturing industry which may useful for industry to survive in market. Computer Integrated Manufacturing (CIM), Group Technology, Work study, Operation Research, Japanese techniques such as Shigeo Shingo principle, Lean

Manufacturing (LM), etc are some of production and quality improvement techniques and concepts. Value engineering and value analysis these are some of concepts which affects production rate of industry positively when implement perfectly at right time. From all these techniques and concepts, LM is the most effective weapon which enhances the progress of the company continuously.

II. INTRODUCTION TO LEAN MANUFACTURING (LM)

LM is a not a tool, it is a business philosophy or concept that continuously improves all processes involved in manufacturing process. It provides a high level of customer service by searching and eliminating non value added activities and waste in terms of time, money, materials. LM is mainly accepted by the organization to reduce the muda (waste), and improve quality of product.

Common LM tools:

1. Value Stream Mapping (VSM): It is the method of dividing various operational activities as value adding, less important non value adding activity, non value adding activity. So that priority of the operational processes or activities carried out by the VSM, accordingly mapping of work is completed. Depending upon VSM's scope it includes all the processes all the way from external supplier to final customer.

2. One-piece-flow: LM eliminates concept of Batch production because it increases company's buffer sizes due to production unevenness in order to create high machine utilization. Its ultimate goal is to reduce the batches and pieces/products flow separately. This process is not feasible for some types of manufacturing e.g. heat treatment process.

3. Kanban: It is a tool used for creating pull production, by using cards (kanban cards) which sends signals what, in what amount, when material is needed. Kanban reduces buffer sizes and work in process (WIP's) to a minimum.

4. Kaizan; It is nothing but the continuous improvement in an organization with the cooperation of all the employees or workers and employers.

5.Takt: Takt means rhythm. It divides the various manufacturing operations into different stations (each takt or station should take same time as that of the other). It is similar to one-piece-flow tool.

6. Poka-Yoke: It is also called as 'Error proofing technique'. Designing of such a system in which there should not be any chances of making error of the human is nothing but 'Poka-Yoka' technique. It is one way of 'building in quality' into a product or service.

7. Andon: It is the Japanese word for 'paper lantern'. In this, 'andon lights' are used to get attention of team leaders informing that a problem has been detected. It works by activating andon lights by the machine operator which are installed on every machine gives the signal about the current situation of the machine.

8. 5s: It is a abbreviation of Seiri, Seiton, Seiso, Seiketsu, Shitsuke. These all are Japanese words whose meanings are:

- a) Seiri (sort): Sort out every component and keep only whichever required.
- b) Seiton (straighten): Every component or equipment should have its own space and keep over there.
- c) Seiso (shine): Keep the work environment neat and clean.
- d) Seiketsu (standardize): Must have systematic approach to implement 5s.
- e) Shitsuke (sustain): Maintain 5s for continuous improvement of organization.

9. Just In time (JIT): It is a concept of producing only those whichever needed. It is nothing but the workstation which have inventory at the right time, in the required amount, and at the required place.

10. Jidoka: It is a Japanese word whose meaning is 'production problem warning system that alerts everyone'. According to this concept the whole production line should be stopped after the detection of problem in the line. So that less damage caused to the whole production line and waste can be reduced.

11. SMED: It is the abbreviation of 'Single Minute Exchange of Die'. The main aim of this concept is to reduce the setup time of machine, so that total lead time will decrease. There two setup times, internal and external setup time. Internal setup time is the time when the machine unconditionally

stands still. External setup time is the time when a machine does not have to stand still.

12. 5-Why: It is the tool which is used to identify the root cause of any problem. The idea of this tool to ask why? 5 times to reported problem so that we get the actual root cause of the problem. It also gives opportunity to undertake for each why-level of the problem.

13. A3 Report: It is a way of displaying all the information needed to make a complex design on A3 sized paper. It speeds up a company's written internal communication by eliminating long and complex report about the design and processes.

14. PDCA (Plan-Do-Check-Act): It is also called as 'Deming's Cycle'. It is a simplified technique or managerial approach towards the processes which used for continuous improvement of an organization.

Plan- Establishing objective of the task that have to develop.

Do- Do the task according to plan.

Check- Check for any error or problem, if any problem raised then identify the root cause of that problem.

Act- Correct the errors and make it compile with standard specifications.

III. METHODOLOGY

For any scientific research, there are two methodologies i.e. qualitative and quantitative. The type of research method depends upon the aim of the research and solutions that comes out after analysis according to Bryman (2002). As the aim of this research is to identify and analyze the barriers encountered in implementation of Lean Manufacturing in SME's of India, qualitative research method is used in this paper. Because this method will helpful for investing questions like how and why to the respondent while surveying. In quantitative method there is a calculation of exact figures which does not give the expected result.

A questionnaire was first prepared by considering the factors that identified by the previous researchers about the LM. In order to achieve our aim, data was collected through the questionnaire survey. This method of survey is best suited for exploratory study of any topic like, LM because it gives larger amount of correct data within short time. The questionnaire is divided into eight sections. Section one is of the demographic details of industry, which consist of overall turnover, total number of labors and type of industry

background of industry. Another section is of external factors, in that how the external factors like competitive pricing, introduction of new product in the market affects the growth of the organization. Product Characteristics is another section which includes the flexibility of industry while changing the type of jobs, delivery schedule, etc. Section four is production and inventory management, in this how much inventory level is managed by industry either using conventional or non conventional methods. Total quality management is another section in which status of LM tools like Poka-Yoke, 5s, Top-Down and Down-Top communication are included. Another section is Total Organization Bay, which includes relationship between employees and employers and how much employee has contributed to achieve company goals. To make competitive in the market, which type of methods or tools should be used by the industry is included in the last section of questionnaire i.e. competitive advantage.

A five point scale is used in this study to indicate how these factors mentioned above affect the organization's overall yield. These five point rating scale is 1- Very effective, 2- Effective, 3- Neutral, 4- Somewhat Effective, 5- Not Effective. The questionnaires are addressed to the General Manager, Plant Head, Project Engineer of the companies. They considered to be the best addresses because they likely to be thought leaders in charge of the LM. After data collection, average mean value is calculated by taking rated value of factors. The average mean value indicates the level of effectiveness of all mentioned factors to the organization.

IV. RESULTS AND DISCUSSION

The respondents to this questionnaire survey were either Plant Head, Project Engineer, CEO of the company. During the survey, the some of the responses were good and some were bitter. In one of the company which was semi automated, the respondent was project engineer, who even don't know that LM is related to Production Process. From this it is clear that people don't have the proper understanding about the LM. The mean value of all the factors and co-factors of LM, is calculated and depending upon these value, highest effective factor is identified. The solution for these identified factors is also mentioned in this paper. The results obtained are:

1) External Factors:

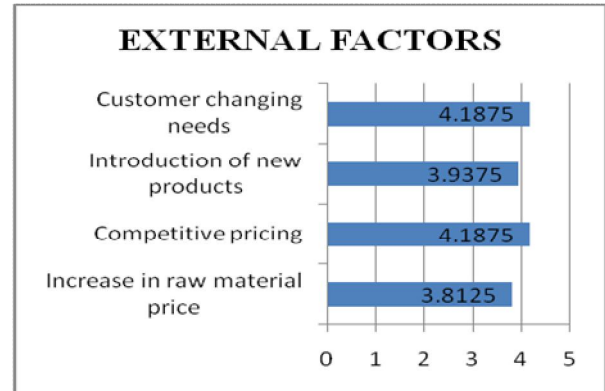


Table 1- External Factors

As per the survey, customer's changing needs and competitive pricing affect the industry more in the way of implementation of the LM. To eliminate these barriers, industry should use Kaizan tool and the employees for the same. This will helps industry to establish own independent stand in the market.

2) Product characteristics:

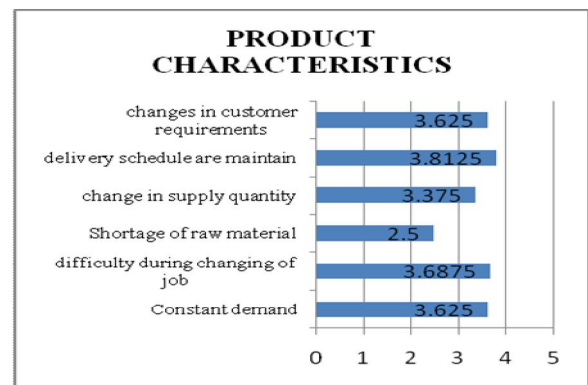


Table 2- Product Characteristics

The delivery schedule is the most important factor which very much helpful to keep the industry-customer relations healthy. The delivery schedule should be maintained by the industry, if industry successfully implements the 5s and Single Minute Die Exchange (SMED). This also helps to keep things or components in right place and setup time, work in process (WIP) will also reduce. Another tool Kanban can also be used for smooth work flow.

3) Production and Inventory Management:

For any organization customer demand plays a vital role, our survey also witnessed about it. The industry has to use Just In Time (JIT) and Kanban tools to meet customer demand at the right time and at the right place.

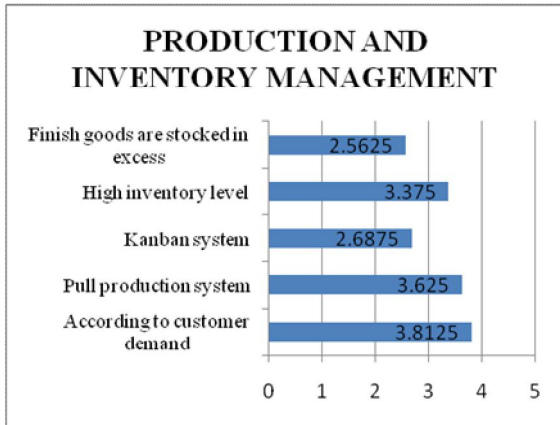


Table 3- Production and Inventory Management



Table 5- Total Organization Bay

4) TQM (Total Quality Management):

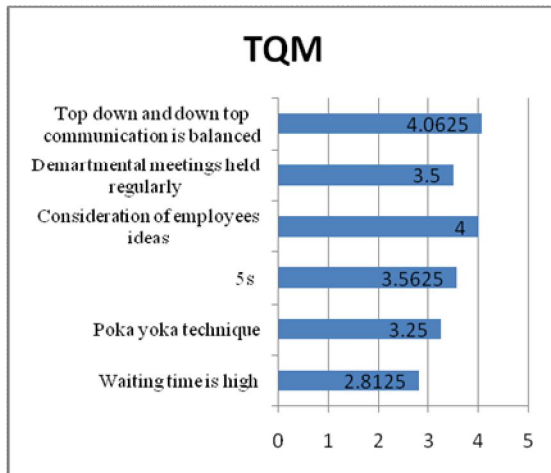


Table 4- Total Quality Management

Good communication between all level labors is much healthier for company’s continuous improvement. Proper communication between higher and lower authorities will help to solve the problems effectively in less time. So to maintain good communication in the industry, the Kanban, Andon, and Quality Circle tools are more effective.

5) Total Organization Bay (TOB):

The safety is an important parameter as per industry as well as the worker is concerned. If safety level is maintained in the industry regularly, it will not only physically, but also psychologically boost the worker to work fearlessly. The safety level should be maintained in an organization by using Andon and Poka-Yoke techniques.

6) Company Progress:

This graph shows customer satisfaction is the main parameter which industry should keep in mind and make customer fully satisfied. For customer satisfaction, the industry should deliver the goods at the right time, quality of the product should improve up to customer demands. To achieve this 5s, Kaizan, Kanban tools should be used.



Table 6- Company Progress

7) Competitive Advantage:

The factor that gives advantage to the industry is new product development or introduction of new product in the market, according to table no. 7. To introduce the new product in the market, the industry should have productive Research and Development (R&D) department, and also in continuous improvement. To cope with this cause, industry must have to adopt Kaizan tool.



Table 7- Competitive Advantage

8) Overall result:

After thorough analysis of the collected data through survey, ‘competitive advantage’ is the main factor which comes in the way of implementation of the LM in SME’s in India. During the survey, lack of interest of management level about LM, Lack of Knowledge about LM, these things comes at front foot. It also affects adversely the market value of the industry. To overcome the adverse effects of this factor, industry should implement LM tools such as, Kanban, Kaizan, JIT, 5s, effectively and maintain these tools to benefit the industry. Because of which industry will become a unique and it hold the commanding position in the market. At the last, these tools will increase the overall profit of an industry.

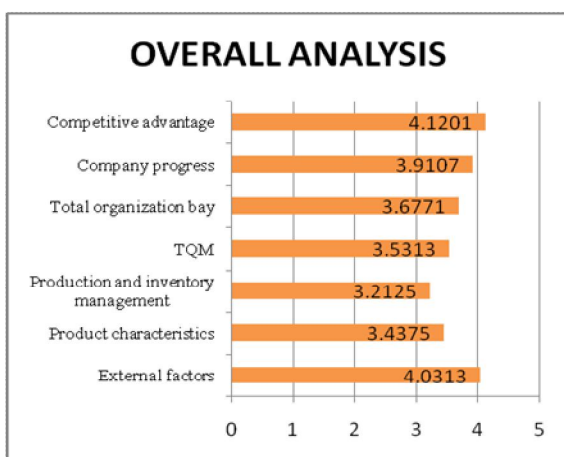


Table 8- Overall Analysis

V. CONCLUSION

The main purpose of this paper is to find out and analyze the main barriers come across in the way of successful implementation of Lean Manufacturing in the industry. After visiting various industries and analysis, it has been found that

many industries try to implement the LM tool, but give up on the same because of lack of knowledge about the LM. The main barrier highlighted many times during whole research is that the work culture and work environment. Management decisions or lack of interest of management is also one of the barriers. Management is not keen to spend much money on training programs for workers. This research will also help industries to identify the main barriers that come in the way of continuous growth of industry as well as implementation of the LM, and will provide perfect suggestions to the industries.

VI. ACKNOWLEDGEMENT

We would like to express our gratitude towards our project guide Prof. Onkar G. Sonare sir, for helping us in this project because of which our project completed in short time.

REFERENCES

- [1] Carlsson Daniel and Peter Froberg (2016): ‘Lean Manufacturing and Company Integration’, SE-221 00, Lund University, Sweden
- [2] Chaple A. P., Narkhade B. E. and Akarte M. M. (2014): ‘Status of Implementation of Lean Manufacturing Principles in the context of Indian Industries: A Literature Review’, Design and Research Conference, Guwahati, Assam, India.\
- [3] Er. Rajeshkumar Mehta, Dr. Dharmendra Mehta and Dr. Navin K. Mehta (2012): ‘An Exploratory Study on Implementation of Lean Manufacturing Practices’, Madhya Pradesh, India.
- [4] Shaman Gupta and Sanjivkumar Jain (2013): ‘A Literature Review on Lean Manufacturing’, Ambala, India.
- [5] Sujatha Y. and Rao K. Prahlad (2013): ‘A Study on Lean Manufacturing Tools and Technique Implementation in the Silk Production Industry in India’, Andhra Pradesh, India.
- [6] Sundar R., Balaji A. N. and R. M. SateeshKumar (2014): ‘A Review on Lean Manufacturing Implementation Techniques’, Tamilnadu, India.
- [7] Khadase Priti B., Sarode Avinash D. and Wasu Renu (2013): ‘Lean Manufacturing in Indian Industries: A Review’, Navi Mumbai, Maharashtra, India.
- [8] Darabi R., Moradi R. and Toomari U. (2012): ‘Barriers to Implementation of Lean Accounting in Manufacturing Companies’, Tehran, Iran