

A STUDY OF EFFECT OF LEAN MANUFACTURING TOOLS ON IMPROVING THE PRODUCTION AND REDUCTION IN LEAD TIME :A CASE STUDY

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ABSTRACT: *In the present study an attempt has been made to identify and eliminate different types of wastages with the application of Lean tools in an automobile industry. In this case study, Labels has been selected due to high aesthetic value, new plant is setup and complicated processing cycle resulting into excessive work in process inventory and long lead time problem. Company is facing problem in the production of Labels. Company does not achieve daily production target as per customer end. Company facing the problems like as large WIP, Production Lead Time, worker motivation and no systematically production approach. VSM has proved effective in identifying and eliminating wastages under these circumstances. After the identification of the gap areas, the Lean Manufacturing tools such as Kaizen, Visual Controls, Kanban System, workplace organization were proposed for productivity and quality improvements. The detailed analysis of current state has been presented and the opportunities for improvement have been presented for eliminating various waste elements and future state VSM has been developed. Solutions suggested lead to a significant decrease in production lead time, work in process inventory and hence overall cost ultimately and solve many problems at customer end.*

I. INTRODUCTION

Back in 1988, a group of researchers working at the Massachusetts Institute of Technology (MIT), led by Dr. James P. Womack, were examining the International Automotive Industry, and observed unique behaviors at the Toyota Motor Company (TMC). Researcher John Krafcik and others struggled with a term to describe what they were seeing. They looked at all the performance attributes of a Toyota-style system, compared to traditional mass production. What they saw was a company that

- Needed less effort to design, make, and service their products
- Required less investment to achieve a given level of production capacity
- Produced products with fewer defects
- Used fewer suppliers
- Performed its key processes including concept-to-launch, order-to-delivery and problem-to-repair in less time and with less effort
- Needed less inventory at every step
- Had fewer employee injuries

They concluded that a company like this, a company that uses less of everything, is a “Lean” company.

Area of Application of lean

Lean is found wherever there is waste, and anywhere there is opportunity for improvement. In other words, Lean is found everywhere. It’s not confined to any particular part of the organization or function of the enterprise. Although formal Lean practices began in manufacturing, they apply across the board. Lean is a business-improvement initiative, best applied enterprise-wide. A common misconception holds Lean as a sort of manufacturing quality program. Not so. The philosophy, principles, and practices of Lean are applicable anywhere, and they are most effective when applied across the entire organization. one may have heard the jargon that implies certain groups or functions practice Lean, such as the following:

- Lean Production or Lean Manufacturing
- Lean Office and Lean Administration
- Lean Management
- Lean Thinking

Lean Manufacturing Principles:

- The Five Lean manufacturing principles given by Burton and Boeder (2003) are as under
- **Value** Define value from the standpoint of the customer. However, in reality, the final customer is the only one who can specify the value of a specific product or service by paying a price for it.
- **Value stream** View your product delivery system as a continuous flow of processes that add value to the product.
- **Flow** The product should constantly be moving through the value stream towards the customer at the pace of demand.
- **Pull** Product should be pulled through the value stream at the customer’s demand rather than being pushed on to the customer.
- **Perfection** The never-ending pursuit of eliminating waste in the system such that the products can flow seamlessly through the value stream at the rate of demand.
- Thus, Lean is basically all about getting the right things, to the right place, at the right time, in the right quantity while minimizing waste and being flexible and open to change.

Lean Manufacturing Structure, Tools and Techniques:

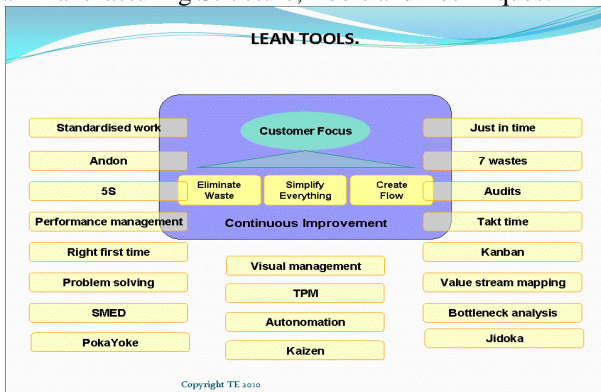


Figure 1.1 Structure of VSM Based Lean Production System

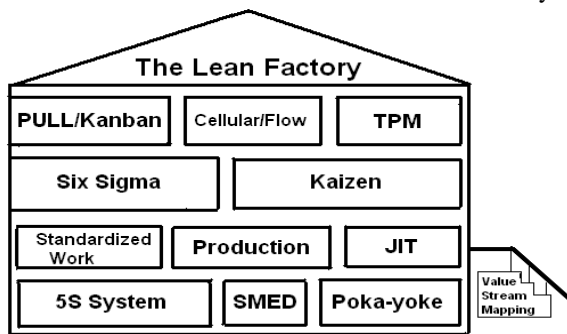


Figure 1.2 Key Lean Tools

Lean manufacturing structure have some tools and techniques above shown figure 1.1 shows the structure of a BSM based lean production system and fig. 1.2 shows the key lean tools used in manufacturing in a lean factory.

II. LITERATURE REVIEW

Womack et al (1990)[1] explained the several features of Lean, According to studies that were initially performed in the automobile industry:-Lean is a dynamic process of change driven by a systematic set of principles and best practices aimed at continuously improving; Lean refers to the total enterprise, from the shop floor to the executive suite, and from the supplier to customer value chain; Lean requires rooting out everything that is non-value-added; and Becoming Lean is a complex business - there is no single thing that will make an organization Lean. Hines and Rich (1997)[2] has opined that, the value stream is “the specific activities within a supply chain required to design order and provide a specific product or value”. McDonald et al. (2002)[3], Lian and Landeghem (2002) and Abdulmalek and Rajgopal (2007) have explored the integration of VSM with simulation. A multitude of VSM software (e.g. eVSM) is available over the internet. Such software presents the user with a dynamic view of the value stream (not static), allowing observation of the “real-time” impact of proposed improvements. Essentially it increases flexibility and information available to improvement teams. Prakash D. (2011)[4] Lean manufacturing is defined as a systematic approach to identifying and eliminating waste through continuous improvement, flowing the product at the pull of the customer in pursuit of perfection. This paper describes

some learning from the literature and actual practices in USA, UK, and India. Attempts are made to present the gaps between the principles and practices. Some pertinent propositions are put forth to enrich the knowledge base of professionals to make the implementation process more pragmatic and robust in the long run and for furtherance of empirical research by academics. Er. Rajesh Kumar (2012)[5] The manufacturing industry in India must also look to leverage its advantages, its large domestic market, good conditions in terms of raw materials and skilled labour, and the quality focus. In India at the state level, there are few companies that are implementing Lean manufacturing techniques. In Dewas city, the industrial town of Madhya Pradesh, some of the automobile companies are vigorously following the Lean manufacturing techniques to eliminate waste and downsize the cost. Hence, all these factors prompted the researchers to analyze and study the implication of Lean Manufacturing Practices in Automobile Industries. Sanjay Kumar(2013)[6] Lean Manufacturing System has emerged as an important area of research in Indian context. The requirement of Lean Manufacturing has increased due to defects in products (semi finished and finished) and subsequent increase in cost. In this context, this study is an attempt to develop a structural model of the variables, important to implement Lean Manufacturing System in Indian automobile industry. Chandradeep Grewal (2008) [5] has explained the methodology of Lean and VSM that can be applied for a small company and also stated that it is a powerful tool to identify the inefficiencies and improvement area. A. P. Chaple (2014) [7] Lean has been recognized as one of the key approaches in enhancing the productivity and hence the competitiveness of an organization. This paper presents a review of lean principles and practices in the Indian manufacturing industries. The paper contributes by identifying enablers & barriers in implementing the lean principles and practices, methodologies used in leanness measurement of an organization in the Indian manufacturing industry. Finally, the diffusion of lean in the Indian manufacturing industries has been given.

III. PROBLEM FORMULATION

The problem related to this product was mainly the high inventory cost and great difference in the production rate in varies shops. The production rate in printing shop was less than other shops. The reason was large waiting time mainly due to difference in processing time at various stages. This leads to increase in lead time and wastages of various resources like labor time and slower production rate. This arrangement increase material handling cost and decreases labor productivity. These results in delay of orders which further disturb the overall schedule at floor shop and affect the production of machine parts. Although the plant has the ability to produce more than they are producing, it is having following limitations.

- Less labor productivity
- More Waiting times
- Large WIP

- Longer material movement
- High inventories.

To overcome these limitations there is a need to identify the key areas which are producing trouble and wastes (seven wastes) and to identify bottleneck operations at shop floor. VSM tool is purposed to locate the source of waste in value stream by the Lean concepts and techniques to improve the productivity, quality of existing traditional manufacturing system and hence increase the profit also. These steps explain work done in varies shops Labels, drawing and using VSM to visualize waste.

There are following objectives of this study

1. To have a look at the comparison of current state and future state map for better inventory control, reduced lead time and station cycle time.
2. Identification of improvement areas using current state map.
3. Reduction in lead time, inventory and cycle time.

Today, automotive dealers have a great concern over improving quality and delivery and decreasing cost, which leads to improved system productivity. In order to remain competitive, waste from the value stream must be identified and eliminated so to run system with maximum efficiencies.

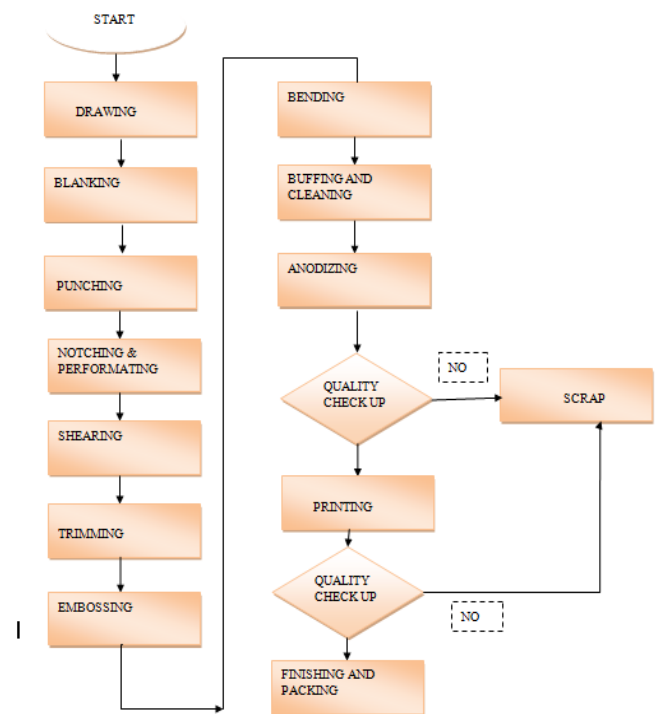
The goal of VSM is to identify, demonstrate and decrease waste in the process, highlighting the opportunities for improvement that will most significantly impact the overall production system. In this study Lean concepts are introduced using VSM in working environment. Methodology for drawing VSM in industry. It consists of following steps

1. Selection of industry
2. Selection of production lines in the industry for study.
3. Preparation of current state map.
4. Proposed changes for future state map.
5. Preparation of future state map.

IV. EXPERIMENTAL SETUP

For the manufacturing of the parts first of all the Overview of The plant is given. Different operations are performed during the manufacturing of the different parts. The operations performed during the manufacturing of different parts the following processes are involved.

A new design of label for ETB (Eicher tractor Bhopal) was provided. These new label were to be developed from two sources. I was involved in getting it developed from New Krishna metal arts. A brief description of how the process works in the development of these Labels is being explained here under. These new designs were given on behest of marketing department either for new tractor models or for the improvement of looks of existing tractor models. The process description is as under



V. CONCLUSIONS AND SCOPE FOR FUTURE

It is rightly argued that whenever there is a product for a customer, there is a value stream. This powerful tool only highlights process inefficiencies, transactional and communication mismatches but also guides about the improvement areas. The following conclusions are drawn from this present study

At Labels Manufacturing Line, it is concluded that

It is helpful in preventing and eliminating waste in our process.

Eliminating the waste have a direct impact on overall cost.

Quality performance, fewer defects and minimum rework.

Lower level of inventory.

Greater customer satisfaction.

Improved delivery time.

Ultimately higher profits.

Production lead time is also reduced from (15 days 1 hour 1minutes and 0.5 sec.) to (11days 45 minute and 47.5 sec.)

Finally processing time is reduced from 75.7 sec. to 55.2

Scope of Future Work

The present study has following scope for future work

This study can be extended by adding more variables like change over time, workers attitude and work environment.

VSM techniques can be also being applied on service industry.

Cost benefit analysis of the modifications made in current state map can also be carried out.

VSM technique can also be applied to some other product line.

Software can be developed to make the VSM more effective.

REFERENCES

- [1] Womack, J.P., Jones, D.T., Roos, D. (1990), "The Machine that Changed the World ", Harper Perennial, New York, NY.
- [2] Hines, P., Rich, N. & Esain, A. (1997), "Creating a Lean Supplier Network A Distribution Industry Case," Proceedings of the Logistics Research Network Conference, Huddersfield, U.K. University of Huddersfield, pp. 60-77.
- [3] McDonald, Sullivan, William G., Thomas N., Aken, Eileen M. Van (2002), "Equipment replacement decisions and lean manufacturing," Robotics and Computer Integrated Manufacturing, Vol. 18, pp. 255-265
- [4] Prakash D.(2011)," Implementation of Lean Manufacturing Principles in Auto Industry," ISSN 2224-6096 (print) ISSN 2225-0581 (online) Vol 1, No.1, 2011
- [5] Er. Rajesh Kumar MEHTA(2012)," An Exploratory Study on implementation of Lean Manufacturing Practices (With Special Reference to Automobile Sector Industry)", YÖNETİM VE EKONOMİ Yıl:2012 Cilt:19 Sayı:2 Celal Bayar University İ.İ.B.F. MANİSA
- [6] Sanjay Kumar(2013)." Implementing Lean Manufacturing System: ISM Approach", JIEM, 2013 – 6(4): 996-1012 – Online ISSN: 2013-0953 – Print ISSN: 2013-8423
- [7] A. P. Chaple(2014), "Status of implementation of Lean manufacturing principles in the context of Indian industry", (AIMTDR 2014) December 12th–14th, 2014