

# Study on Recent Trends in Lean Manufacturing

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**Abstract:** *Lean management simply known as lean in production practice. Which use resources for any work other than the creation of value for the end customers and targets to eliminate losses. All manufacturing industries are in the race to reduce losses that are happening in the shop floor due to manufacturing. A comprehensive study is done to find out the solution to it. This paper will assist how to reduce losses and improve quality in production.*

**Keywords:** Lean Manufacturing, Tools of Lean Manufacturing

## 1. Introduction

In the current era of globalization, industries are adopting new techniques to produce goods to compete and survive in the market. The most daunting issue faced by manufacturers in competitive environment, today is how to deliver their products or materials quickly at low cost and best quality. One promising method for addressing this issue is the application of lean management principles and techniques. Lean management simply known as lean is production practice, which is regards the use of resources for any work other than the creation of value for the end customers, is waste, and thus a target for eliminate. Though there had been numerous claims on the real origin of Lean Manufacturing principles, it was generally accepted that concept With this back ground, business needs to compete with efficiency and quickly respond to market needs and niches.

There is no doubt that the manufacturing industry are confronted with challenges and looking to implement improvements in their key activities or processes to cope with the market fluctuations and increasing customer demands. Applying lean management philosophy is one of the most important concepts that help businesses to complete. In this paper, the literature survey findings such as existing level of lean practices, types of lean tools techniques employed, and perceived level of different Encountered by the various manufacturing industries are discussed.

## 2. Literature Review

A detailed review of research in current trend of lean management in various manufacturing industry like

automotive industry, semi-process industry, machine tool industry, electronics manufacturing industry, steel industry, pump industry and furnishing industry has been discussed. Lean manufacturing is a multi-dimensional management practice including just in time-quality systems, work teams, cellular manufacturing, supplier management etc. the popular definition of Lean Manufacturing and the Toyota Production System usually consists of the following, Wilson (2009).

- It is a comprehensive set of techniques which when combined allows you to reduce and eliminate the waste. These will be made the company leaner, more flexible and more responsive by reducing waste.
- Lean manufacturing is the systematic approach to identifying and eliminating waste through continuous improvement by flowing the product or service at the pull of your customer in pursuit of perfection.
  - (i) This is an overview& survey for finding the current situation of lean management practices in manufacturing industries.
  - (ii) It is a measure to identify the constrains that retains lean manufacturing in the infant stage in manufacturing firms and helps to identify the mud (waste) that evolves in an processing unit and gives out supporting measures to remove the same. The constraint that predict the implementation and sustainability of lean manufacturing tools and techniques are also discussed.

### 2.1 Lean Manufacturing System

Lander and Liker (2007) discussed the performance benefits of lean systems are often remarkable, greatly improving product quality, delivery and cost, delivery and studied the fundamental misunderstanding of TPS, viewing it as a

specific tool kit technically implemented in a formulaic way to achieve pre-specified results. According to Shah and Ward (2007) lean production is a multi-dimensional approach that encompasses a wide variety of management practices, including just in time, work teams, quality system, cellular manufacturing and supplier management in an integrated system. Petersen (2003) in his article made the analysis of the lean literature and concluded that among the authors dominates a view that lean is more than a set of tools, since it is a philosophical approach to lean manufacturing. Therefore, lean production is also considered as the philosophy of continuous improvements and respect to people.

### 2.2 House of Lean

Liker (2003) illustrated the most common lean tools in the form of house as shown in Figure 1. The goal of lean production is set in the roof and consists of reaching for the best quality, lowest costs, shortest lead-time, high moral and highest safety. The left pillar encloses Just-in-Time principle that consists of production planning and leveling tools like tact time, continuous flow, pull system, quick changeover and integrated logistics. The right pillar deals with Jidoka, which prevents a defective part from proceeding into the next workstation as well as insists on separating people from machines. People are in the centre of the lean house concept since people see waste and solve problems that lead to continuously improvement of the processes. In addition, it is important to consider the characteristic of a lean work organization since the responsibilities are decentralized to multifunctional team. The foundation of the house has to be stable for the pillars to stand steadily and consists of the tools like 5S, standardized work and leveled production.

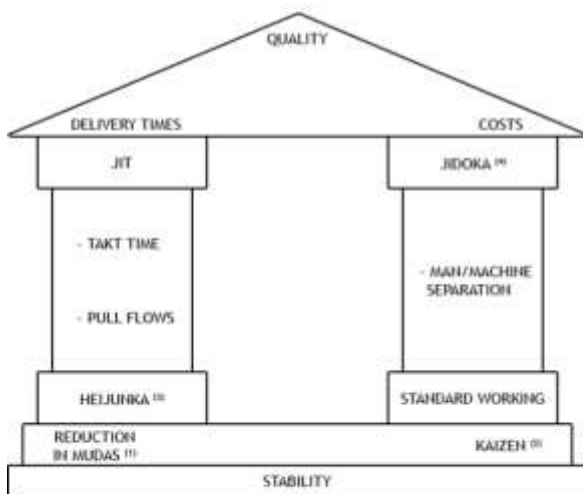


Figure 1: House of lean

### 2.3 Lean Wastes

According to David Magee (2007), different kinds of wastes in a process are categorized in following categories.

- 1) Overproduction – Producing items more than required at given point of time i.e. producing items without actual demand creating the excess of inventories, which needs

excess storage area, excess staff as well as transportation etc.

- 2) Waiting – Workers waiting for raw material, the machine or information etc. are known as waiting and is the waste of productive time.
- 3) Unnecessary Transport – Carrying of Work in Process Inventory (WIP) a long distance travel, insufficient transport, moving material from one place to another place is known as the unnecessary transport.
- 4) Over processing – working on a products, more than the actual requirements is termed as over processing.
- 5) Excess Inventory - This includes excess raw material, WIP or finished goods causing due to longer lead times, obsolescence, damaged goods, transportation and storage
- 6) Costs and delay. In addition, the extra inventory hides problems such as production imbalances, late deliveries from suppliers, equipment downtime, defects, and long setup times.
- 7) Unnecessary Motion – Any wasted motion that the workers have to perform during their work is termed as unnecessary movement.
- 8) Defects – Defects in the processed parts is termed as waste. Repairing defective parts or producing defective parts or replacing the parts due to poor quality etc. is the waste of time and effort.
- 9) Unused Employee Creativity – Loosing of getting better ideas, improvement, skills and learning opportunities by avoiding the presence of employee is termed as unused employee creativity.

### 3. Some of Lean Manufacturing Tactics

- Mistake proofing - “POKA-YOKE”
- Value stream mapping
- Work place organization
- Low cost automation
- Multi machine manning
- Sequencing
- Just in time - JIT
- Standard operating procedure
- Self certification / statistical
- Process control
- Visual controls
- KANBAN system - pulling system
- Single piece flow
- Cell layout of industry
- Line balancing
- Total productive maintenance safety



Figure 2: Lean tools

### 3.1 Lean Practices in Various Manufacturing Industries

In recent years, a plethora of literature has made the successful implementation of lean philosophy into various manufacturing sectors. Eswaramoorthi et al, (2011) discussed the current status of lean implementation in Indian machine tool industries as well as tinted some allied issues. The survey has attempted to formulate the simple questionnaire based tool to identify the existing level of lean practices, reasons for inadequate priority to lean concepts, type of lean tools & techniques employed, perceived level of different wastes, and common difficulties encountered by the Indian Machine tool Manufacturers. The survey results revealed that 31,6% of the companies have implemented different lean tools and techniques in selected areas. The remaining 68,4% of the companies have not yet taken up the lean initiatives. Implementation is also snail-paced, and it has further scope to develop focused lean concepts, which could be implemented in other kind of manufacturing environment like low volume and high variety. It is concluded that the major reasons for low level of lean implementation are anxiety in changing the mind-set of workers, lack of awareness and training about the lean manufacturing concepts and cost and time involved in lean management implementation. Therefore, the machine tool manufacturing companies need to give attention to implement lean in all the key areas from a holistic perspective. Ajith kumar sahuo et al (2008) suggested a systematic approach for the implementation of lean principles and also describes an application of Value Stream Mapping (VSM). Consequently, the present and future states of value stream maps are constructed to improve the production process by identifying waste and its sources. Furthermore, Taguchi's method of design of experiments is pursued here to minimize the forging defects produced due to imperfect operating conditions. A noticeable reduction in set-up time and Work-in-Process (WIP) inventory level is substantiated. Nitin Upadhye et al, (2010) described major actions taken by the company to implement lean philosophy to improve its efficiency and effectiveness. This study attempted to point out various wastages and issues to implement the lean manufacturing systems in MSME. It is observed that Lean Manufacturing Systems (LMS) helps to identify and minimize waste. Lean tools like kaizen, JIT, VSM, 5S, SQC, preventive maintenance, total employee involvement, and SMED were used to find and eliminate the wastages in a MSME. The implementation of the lean tools and techniques will be successful only if these are used wisely. The MSMEs have to go long way to achieve lean status with the use of proper lean tools and techniques, which are suitable to their work cultures, conditions and available infrastructure. It is the tedious irrespective of its status should adopt lean philosophy as an improvement strategy. Lean management is most suitable improvement strategy for all manufacturing industries like OEMs and component manufacturing industries. Pool et al, (2011) al studied the principal of flow and pull production the different types of

inventories are sensitive to different contingency factors. WIPs affected strongly by the production system, while the type of order affects raw material and finished goods and further emphasis the important of the proper decoupling point placement in the supply chain. Behrouzi et al, (2011) presents an innovative approach to measure the lean performance of manufacturing systems by using fuzzy membership function. Rubio et al 2008 has implemented a reverse logistics system for remanufacturing end-of-life products in a lean production environment. Rachna Shah et al,(2007) mapped the operational space corresponding to the conceptual space surrounding lean production also identified the critical factor of lean production, how are the various factors of lean production related to each other and why they are related. Fawaz et al, (2007) described a case where lean principles were adapted for the process sector for application at a large integrated steel mill. They have used value steam mapping as a lean tools to identify the Opportunities for various lean techniques and described a simulation model to contract before and after scenarios in detail to reduce production lead-time and to lower work in process inventory. Doolean et al, (2005) found that while electronic manufacturers have implemented a broad range of lean practices, the level of implementation thus vary and may be related to economic, operational or organizational factors.

### 4. Conclusions

Manufacturers are under intense, remorseless pressure to find a new ways to reduce production cost, elimination of waste, enhance high quality of product, increase the productivity, and better customer satisfaction. These parameters are the usually achieved through the implementation of lean management practices in their industries. The conventional manufacturing practices are indicated inadequate representation in lean management. This paper presented an important impending into the status of lean manufacturing implementation in manufacturing industries. The progress in the lean implementation is snail-paced and needs to be augmented. It has a further scope to developed focused lean concept, which could be implemented in other type of manufacturing environment like low volume, high variety & high volume & low variety. The major reasons for the low level of the lean management were anxiety in changing the attitude of workers, lack of awareness, and training about the lean management concepts, cost and time involved in lean implementation. So, it can be concluded that the manufacturing industry needs to give more attention to implement lean management in all the key areas. Hence appropriate lean education, training, and research setup in association with manufacturing industries are to stimulate the lean awareness and technological development in all type of manufacturing industries.



This helps to industries and researchers create awareness about Lean Managements Tools & techniques, so as it could be supportive to opt suitable lean practices for implementation, continuous development and for sustaining leanness in the competitive environment of current scenarios.

#### Reference

- [1] Ajith Kumar Sahoo, N.K. Singh, Ravi Shankar, M.K. Tiwari. Lean Philosophy: implementation in a forging company .International Journal of Advanced Manufacturing Technology. 2008.36:451- 462.
- [2] Arnout pool, Jacob Wijgaard, Durk-Jouke van der zee, 2011, Lean planning in the semi-process industry, a case study International journal of production economics 2011. 131: 194-203.
- [3] Farzad Behrouzi and Kuan Yew Wong. Procedia computer science. Lean performance evaluation of manufacturing systems; a dynamic and innovative approach. 2011.3 388-395.
- [4] Krisztina Demeter, Zsolt Matyusz. The impact of lean practices on inventory turnover-- International journal of production economics.2011 .133; 154-163.
- [5] Lander, E., Liker, J. KThe Toyota Production System and art: makinghighly customized and creative products the Toyota way, International Journal of Production Research, University of Michigan, USA. 2007.
- [6] Liker, J. Toyota Way. Blacklick, OH, USA: McGraw-Hill Professional Publishing, p. 28- 33,2003.David Magee, How Toyota Became # 1 Leadership Lessons from the World's Greatest Car Company. New York, USA: Penguin Group. 67. 2007.
- [7] M.Eswaramoorthi, G.R. Kathiresan, P.S.S.Prasad, P.V.Mohanram. A survey on lean practices in Indian machine tool industries. International journal of advanced manufacturing technology.
- [8] Nitin Upadhye S.G Desmukh, Suresh Garg. Lean manufacturing system for medium size manufacturing enterprises: an Indian case. International Journal of Management science 2010, 5(5): 362-375. Petersen, J. Toyota Way. Blacklick, OH, USA: McGraw-Hill Professional Publishing; p.28-33. 2003.
- [9] Richard Schonberger. Best Practices in lean six sigma process improvement. John wiley& sons, Inc; 2007.
- [10] Shah, R, Ward, P. T. Defining and developing measures of lean production, Journal of Operations Management, 2007. Vol. 25 No. 4, 785-805. Vorne, 2012
- [11] Wilson, L. How to Implement Lean Manufacturing. New York: McGraw-Hill Professional Publishing; 2009.
- [12] Womack, J.P., Jones, D.T. and Ross, D. The Machine That Changed the World. Canada: Macmillan Publishing Company; 1990.