

Lean Manufacturing: A Review

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Abstract

All manufacturing industry has put in continuous efforts for its survival in the current impulsive and competitive economy. In order to handle the critical situation, manufacturers are trying to implement new and innovative techniques in their manufacturing process by making it more effective and efficient. A detailed literature survey has been conducted to identify the lean practices in various manufacturing industry. The results revealed that the status of Lean Manufacturing (LM) implementation in still in thriving stage. This paper will further assist the organizations to improve its process, align it to the requirements of its customers and relentless contribution to manufacturing sector to enhance productivity, quality and competitiveness is immense.

Keywords

Lean, Manufacturing, Waste

I. Introduction

Lean manufacturing is a Japanese method focused on 3M's. These M's are: muda, the Japanese word for waste, mura, the Japanese word for inconsistency, and muri, the Japanese word for unreasonableness. Muda specifically focuses on activities to be eliminated. Within manufacturing, there are categories of waste. Waste is broadly defined as anything that adds cost to the product without adding value to it. Generally, muda (or waste) can be grouped into the following categories:

1. Excess production and early production
2. Delays
3. Movement and transport
4. Poor process design
5. Inventory
6. Inefficient performance of a process
7. Making defective items

II. Literature Review

A detailed review of research in current trend of lean management in various manufacturing industry like automotive industry, machine tool industry, semi-process 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:

- It is a comprehensive set of techniques which when combined allows you to reduce and eliminate the wastes. This will make the company leaner, more flexible and more responsive by reducing waste.
- Lean 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.

III. House of Lean

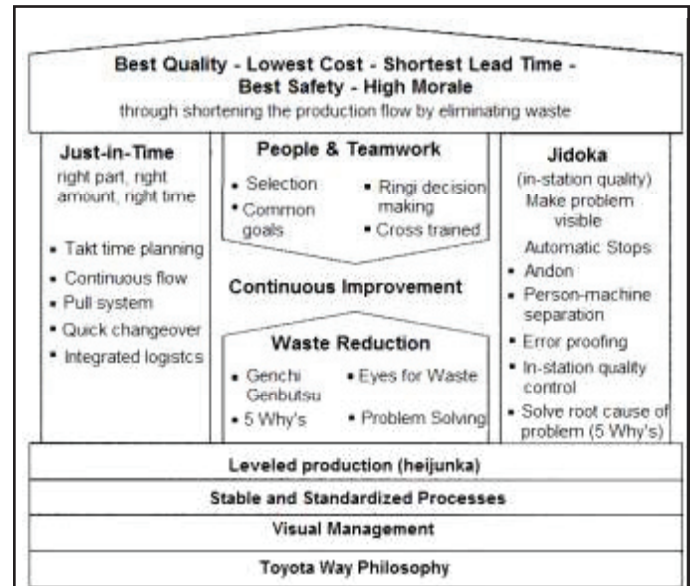


Fig. 1:

The goal of lean production is set in the roof and consists of reaching for the best quality, lowest costs, shortest lead-time, highest safety and high morale. The left pillar encloses Just-in-Time principle that consists of production planning and leveling tools like takt 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 center 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 teams. 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.

IV. Lean Wastes

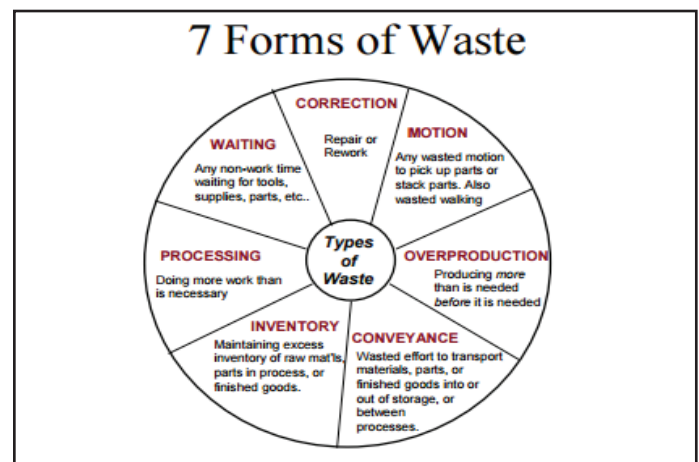


Fig. 2:

1. Overproduction

Producing items more than required at given point of time i.e. producing items without actual orders creating the excess of inventories, which needs excess staffs, storage area 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, insufficient transport, moving material from one place to another place is known as the unnecessary transport.

4. Over Processing

working on a product, more than the actual requirements is termed as over processing.

5. Excess Inventory

This includes excess raw material, WIP or finished goods causing longer lead times, obsolescence, damaged goods, transportation and storage costs, and delay. In addition, the extra inventory hides problems such as production imbalances, late deliveries from suppliers, defects, equipment downtime, and long setup times.

6. Unnecessary Motion

Any wasted motion that the workers have to perform during their work is termed as unnecessary movement.

7. 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.

8. 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.

A. Essential Lean Management Tools

The most important lean management tools such as 5S, Andon, Bottleneck Analysis, Continuous Flow, Gemba, Heijunka, HoshinKanri, Jidoka, Just-In-Time, Kaizen, Kanban, KPI, Overall Equipment Effectiveness, PDCA, Poka-Yoke, Root Cause Analysis, Single Minute Exchange of Die (SMED), Six Big Losses, SMART Goals, Standardized Work, TaktTime, Total Productive Maintenance, Value Stream Mapping and Visual Factory used for productivity improvement in manufacturing industries.

B. Challenges in Lean Implementation and Sustainability

The challenges faced in the process of implementing and sustain lean is a tedious job as the concept relates to time, cost, interest, and involvement, the concepts that together support the new change for development in an firm. The study tells that new firms introduce and accept lean manufacturing and other innovative concepts than the old and existing firms. The forces opposing and driving a change to lean is shown in Figure. The following important factor of resistance to change in manufacturing sectors is:

1. Fear to change the legacy system with the new successful trends and methodologies

2. Not utilizing the opportunities and advantages of the new policies
3. Market destabilization will lead to force the change, which will be in a non-standard format.

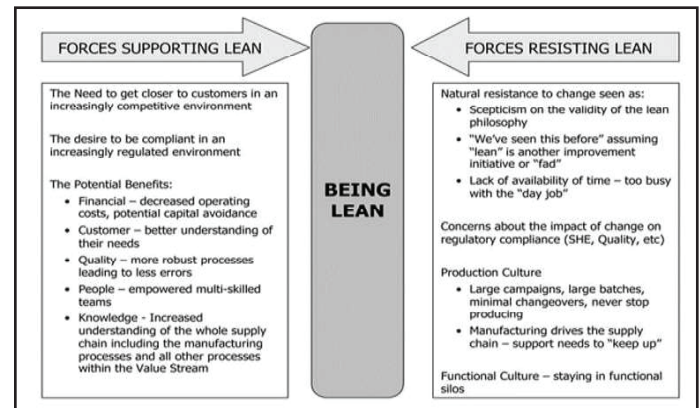


Fig. 3:

V. Conclusion

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 usually achieved through the implementation of lean management practices in their industries. The traditional manufacturing practices are indicated inadequate representation in lean management. This paper presented an important imminent into the status of lean manufacturing implementation in manufacturing industries. The progress in lean implementation is snail-paced and needs to be augmented. It has a further scope to develop focused lean concepts, which could be implemented in other kind of manufacturing environment like low volume, high variety and high volume and low variety. The major reasons for the low level of 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. Therefore, 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, and 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.

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