

## Lean Implementation in Manufacturing Industries – A Review

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### ABSTRACT

*With time manufacturing industries are shifting to the places where labor charges are less but once the industry is set up the manufacturing cost starts increasing as with time there will be hike in charges of labors, raw material, transport, power, fuel, maintenance etc. these all will contribute in higher manufacturing cost. Manufacturing cost per unit will see continuous uptrend and that to sustain in this competitive market manufacturer cannot increase the selling cost, this results in reduction of the profit margin (percentage). Profit can be increased by two ways either by increasing selling price or by reducing manufacturing cost. The first option is not feasible therefore; to sustain in the competitive market the only option remain to work on manufacturing cost reduction. The big question arises how one can reduce manufacturing cost? The answer is by implementing lean manufacturing. Lean manufacturing and their tools is a perfect way to reduce wastages. Lean manufacturing works on elimination of non-value activities. Once non-value added activities get reduce automatically there will be increase in value added activities. Customer pays only for value added activities so keeping in this mind implementing lean manufacturing may become need for manufacturing industries. This paper includes information about lean manufacturing and lean tools, benefits of implementing lean manufacturing and steps involved in implementation*

**Keywords:** Lean manufacturing, tools, 7 types of wastages, benefits of lean implementation.

### I INTRODUCTION

Toyota manufacturing started Lean implementation long back. Also Henry Ford is the person who had been using parts of Lean as early as the 1920's he believed and proved that Shortening of the production cycle time reduces manufacturing cost and longer the process of manufacturing leads to high manufacturing cost. The dictionary meaning of word lean means "Thin" in English. National Institute of Standards and Technology Manufacturing Extension Partnership's Lean Network: defined lean 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."

Most organization decides selling price of product as follow

Selling price = Manufacturing costs + Profit

In this competitive world one cannot increase-selling price, instead of this organization should work on the following formula

Profit = Selling price – Manufacturing Costs

Lean works to reduce manufacturing costs. Companies that implement Lean typically make significant cost savings so there is direct improvement in profitability.

To become best manufacturing organizations or Lean Enterprises the first step in achieving that goal is to identify and try to eliminate the all type's wastes. As Toyota and other excellent organizations have come to realize that customers are only pays for value added work, but never for waste

In simple words Lean manufacturing works on 3 'M' which is related to waste reduction.

- (a) Muda:- Systematic approach for waste elimination
- (b) Mura:- Waste generated by uneven work load.
- (c) Muri:- Waste created by overburden.

Lean manufacturing is also about conversion of push system to pull system.

### II THE SEVEN WASTES

- (a) **Transporting** – Transportation does not add any value to the product also in increases material movement and handling which cause damage deteriorates quality of the product. Transportation waste is very difficult to reduce due to the costs of moving equipment and processes closer together also it is difficult to determine which processes should be next to each other. Material handling equipment and Mapping product flows can make this easier to visualize.
- (b) **Unnecessary Inventory** - This waste is result of other wastage like over-production and waiting. Work in progress (WIP) should be an optimum inventory to work continuously but if it is more than requirement then it is an excess inventory. Identification of problems gets delay this is the biggest problem with the excess inventory. This causes more rework, less productivity, increase in lead-time. In addition, Inventory blocks cash flow for organization.
- (c) **Unnecessary / Excess Motion** - Motion doesn't add any value to the product or service. "To move and add value is called work. To move and not add value is called motion. Motion means moving without working, moving and adding cost". This waste is related to ergonomics in terms of walking, bending, lifting, stretching and reaching. Also repetitive motion causes health and safety issues, which in today's society are becoming more of a problem for organizations. An analysis should be done to the Jobs with excessive motion and it should be re-designed for betterment.

- (d) **Waiting** - Traditional batch-and-queue manufacturing contains maximum waiting time. Poor material flow, too long production run and improper work balancing between two operations these are the major reasons that cause waiting type of waste. Waiting for man, material and Machine leads to lesser productivity. Waiting time is directly proportional to the lead-time. Linking processes together and balancing proper work content in two sub-sequent reduces waiting.
- (e) **Overproduction** - Overproduction is about manufacturing too much or too early. Even some companies makes more production in some excess percentage so that if any problem comes in the process they can utilize that excess production but Overproduction is highly costly to a manufacturing plant because it actually degrades quality and productivity. Just in time (JIT) is the system implemented by Toyota manufacturing to reduce this waste. In JIT product is made just as it is needed. In addition, Overproduction leads to,

- excessive lead-time, high storage cost and it makes process difficult to identify defects.
- (f) **Over Processing** - The waste over processing is the cause of extra operation, inappropriate techniques, handling, oversize equipment, storage, working on tolerances that are very tight also adding extra processes, which are not required by the customer and so forth. These all adds cost, time and money. Low cost automation and doing right for first time is the solution for this waste.
- (g) **Defects** - Defects are products or services that do not conform to the specification or Customer's expectation and which causing Customer dissatisfaction. Defects in a process causes rework or scrap which increases cost to organizations. Through employee, involvement and Continuous Process Improvement both can contribute to reduce defects at many facilities. There are two more types of additional wastages are :
  - (i) Energy wastage.
  - (ii) Less utilization of talent.

### III STEPS FOR LEAN IMPLEMENTATION



### IV LEAN TRAINING

To get the best result, involvement of everyone is important. This involvement can be achieved with proper training. Top down approach can be followed for training. Top down means starting from the top management it goes bottom to operator level so that everyone is on the same page. Everyone should

understand what lean manufacturing is and what benefits industry will get with lean implementation.

### V LEAN TOOLS

5 'S' and Kaizen are the best lean tools to start for any organization. 5 S means - Sort, Set in order, shine, Standardize and sustain while Kaizen means change for better. Both tools are actually Japanese business

philosophy of continuous improvement of working practices, personal efficiency, etc. Few expert says only proper 5's' and kaizen implementation is enough to improve organization. The list of other tools and their short meaning is given below.

Lean Tool	Meaning
5 S	Sort, Set in Order, Shine, Standardize, Sustain. In short 5'S' works to have "place for everything and everything on its place".
KAIZEN	Kaizen is an approach to create continuous improvement in industry based on the idea generated by anyone from the industry.
SMED	SMED (Single-Minute Exchange of Dies) is a system to reducing the change over time drastically.
ANDON	Andon means Light. It is used to generate an alarm to workers. This alarm can be used to highlight the problems within the production process.
KANBAN	Kanban means a signboard, it help to visualize your work, maximize efficiency and become agile.
ROOT-CAUSE ANALYSIS	It is a popular and widely technique that helps people to get the answer of why the problem occurred in the first place.
POKA-YOKE	Poka-yoke means "mistake-proofing". In process, by mistake also mistake should not happen.
OEE	OEE (Overall Equipment Effectiveness) is an measures to show percentage of planned production time that is truly productive.
PDCA	PDCA (plan-do-check-act) is four step management method used in industry to improve processes and products.
JUST IN TIME	JIT is a management tool to control inventory that calls for the production of what, when, how much and where customer wants.
VALUE STREAM MAPPING	VSM is defined as a lean tool that employs a flowchart documenting every step in the process.
GEMBA	The Gemba Walk means walk the floor of their actual workplace to identify wasteful activities.
CONTINUEOUS FLOW	Continuous flow work on work-in-process to have smooth flows through production with minimal buffers between processes.
TPM	Total Productive Maintenance creates a shared responsibility for equipment that encourages greater involvement by operators
BOTTLENECK ANALYSIS	It identify which part of the manufacturing process limits the overall throughput and improve the performance of the process.

Other lean tools are Jidoka, Hoshin Kanri, Heijunka, Key Performance Indicators, Six Big Losses, SMART Goals, Standardized Work, Takt Time and many more are there. Organization can implement any lean tool as per the requirement.

## VI ADVANTAGES OF LEAN IMPLIMENTATION

- (a) Increase in value added activities
- (b) Reduction in wastages
- (c) Higher Profits.

- (d) Better Quality
- (e) Reduction in Over Time
- (f) Greater Customer Satisfaction.
- (g) Reduction in Machine Breakdowns.
- (h) Reduction in Inventory.
- (i) Improvement in cashflow
- (j) Reduced Lead Time
- (k) Betterment in Space Utilization
- (l) Higher efficiency
- (m) More output per person-hour.
- (n) Improved Visual Management
- (o) Helps to reduce Manpower
- (p) Improved Visibility to Stakeholders
- (q) Improved on time delivery percentage
- (r) Improved employee morale and involvement.
- (s) Safer Work Environment

### VII DISADVANTAGES OF LEAN IMPLIMENTATION

- (a) Low inventory.
- (b) Difficult to change over
- (c) Little margin for error
- (d) Lack of Acceptance by Employees

### VIII CONCLUSION

Visionary management can think of Lean implementation in their business to sustain in competitive world and to improve profit. Lean is fully focusing on elimination of non-value added activities and it add value to the product. Lean is applicable to any business but Lean implementation is becoming a need for a manufacturing organization. Being lean gives lot of advantages to organizations. Organization become

more productive and responsive to market than other organization in all aspects.

### REFERENCES

- [1] R.Sundar, A.N.Balaji, R.M.SatheeshKumar, A Review on Lean Manufacturing Implementation Techniques 12th Global Congress on Manufacturing and Management, Gcmm (2014)
- [2] David Losonci, Krisztina, Demeter,Istvan Jenei, Factors influencing employee perceptions in lean transformations, Int. J. Production Economics (2011)
- [3] Wilson, L. How To Implemen Lean Manufacturing. New York: McGraw-Hill (2010).
- [4] Womak, J.P. & Jones, D.T. Lean Thinking: Banish waste and create wealth in your co/poration. New York: Simon and Schuster (1996).
- [5] Shamim, Benefits of Lean Manufacturing | Why Implement  
Lean?http://leanmanufacturingtools.org/63/benefits-of-lean-manufacturing/ accessed on:8th July 2019.
- [6] George, M.L. Lean Six Sigma: Combining six sigma quality with lean speed. New York: McGraw-Hill ISBN- 9780071501903 (2002).
- [7] Seven Types of Deadly Wastehttp://www.leaninnovations.ca/seven\_types.html#:~:text=Motionaccessed on:8th July 2019