



ISSN: 0976-3031

Available Online at <http://www.recentscientific.com>

CODEN: IJRSFP (USA)

International Journal of Recent Scientific Research
Vol. 9, Issue, 6(A), pp. 27240-27243, June, 2018

**International Journal of
Recent Scientific
Research**

DOI: 10.24327/IJRSR

Research Article

METHODS USED IN LEAN MANUFACTURING TO IMPROVE THE PRODUCTION PROCESS

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DOI: <http://dx.doi.org/10.24327/ijrsr.2018.0906.2218>

ARTICLE INFO

Article History:

Received 15th March, 2018

Received in revised form 25th

April, 2018

Accepted 28th May, 2018

Published online 28th June, 2018

ABSTRACT

This article presents an overview on the Lean Manufacturing processes. One of the main objectives of creating a lean environment is to reduce the wasteful activities. This article introduces the reader to the different types of wastes that can be encountered in a manufacturing plant. The various tools used to achieve a lean environment is also discussed in this article. The main intention behind this article is to enable the readers to get a basic idea about lean manufacturing and its benefits, thereby help them to implement these principles to the organisations and fetch immense amount of improvement in terms of productivity, quality and also the market standards

Key Words:

Lean manufacturing, waste, types of waste tools used in lean manufacturing

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INTRODUCTION

Lean manufacturing is a way to eliminate the waste and to improve the efficiency of manufacturing environment. The lean focuses on flow, the value stream and eliminating Muda, the Japanese word for waste. Lean manufacturing is the production of goods using less of everything compared to traditional mass production (less waste, human effort manufacturing space investment, inventory). Striving to do more with less and do it consistently.

Lean was generated from the just in time(JIT) philosophy of continuous and forced problem solving. Justin time is supplying customers with exactly what they want when they want it. Lean manufacturing is sometimes called Toyota production system(TPS)because Toyota Motor company's Eiji Toyoda and Taiichui Ohno are given credits for its approach and innovations. Lean manufacturing is sometimes called Toyota production system (TPS) because Toyota Motor company's Eiji Toyoda and Taiichui Ohno are given credits for its approach and innovations. [1]

What is waste?

Waste is anything that happens to a product that does not add value to the customers perspective Products being stored inspected or delayed products waiting in queues and defective does not add value. The simplest way to describe waste is as

“Something that adds no Value.” The customers would not be happy to pay for any action that we take that does not add value to what they actually want and nor should we be. Would you be happy if you received a bill in a restaurant that included a meal that was prepared in error? No; you would argue and demand that it was removed from your bill; yet if you buy a product in a store the price that you pay will contain costs that you would not want to pay. Would you want to pay for the machine operators wages whilst they sat idle waiting for a delivery, or for the rework processes that had to be undertaken because the machine was incorrectly set, or even for storing your product for three months before it was delivered to the store? These wastes are included within the cost of your products, either inflating the price you pay or reducing the profit of the company. [1]

Types of waste

The seven wastes of Lean Manufacturing are what we are aiming to remove from our processes by removing the causes of Muda(waste), Muri(overburden) and Mura(unevenness) The Seven Wastes of Lean Manufacturing are:

Transportation-moving material between plants, between work centres and handling more than once is waste. Transport is the movement of materials from one location to another, this is a waste as it adds zero value to the product.Transport adds no value to the product, you as a business are paying people to

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move material from one location to another, a process that only costs you money and makes nothing for you. The waste of Transport can be a very high cost to the business, you need people to operate it and equipment such as trucks or fork trucks to undertake this expensive movement of materials.

Inventory-unnecessary raw material, finished goods, and excess operating supplies. Inventory costs you money, every piece of product tied up in raw material, work in progress or finished goods has a cost and until it is actually sold that cost is yours. In addition to the pure cost of your inventory it adds many other costs; inventory feeds many other wastes. Inventory has to be stored, it needs space, it needs packaging and it has to be transported around. It has the chance of being damaged during transport and becoming obsolete. The waste of Inventory hides many of the other wastes in your systems.

Motion- Unnecessary motions are those movements of man or machine which are not as small or as easy to achieve as possible, by this I mean bending down to retrieve heavy objects at floor level when they could be fed at waist level to reduce stress and time to retrieve. Excessive travel between work stations, excessive machine movements from start point to work start point are all examples of the waste of Motion. All of these wasteful motions cost you time (money) and cause stress on your employees and machines, after all even robots wear out.

Waiting/ Queue-idle time, storage and waiting are wastes. How often do you spend time waiting for an answer from another department in your organization, or waiting for a delivery from a supplier or an engineer to come and fix a machine? We tend to spend an enormous amount of time waiting for things in our working lives (and personal lives too), this is an obvious waste.

Over-Processing- The waste of over processing is where we use inappropriate techniques, oversize equipment, working to tolerances that are too tight, perform processes that are not required by the customer and so forth. All of these things cost us time and money.

Overproduction-producing more than the customers' orders or producing early. Inventory of any kind is usually a waste. The most serious of all of the seven wastes; the waste of overproduction is making too much or too early. This is usually because of working with oversize batches, long lead times, poor supplier relations and a host of other reasons. Overproduction leads to high levels of inventory which mask many of the problems within your organization. The aim should be to make only what is required when it is required by the customer, the philosophy of Just in Time (JIT).

Defects- The most obvious of the seven wastes, although not always the easiest to detect before they reach your customers. Quality errors that cause defects invariably cost you far more than you expect. Every defective item requires rework or replacement, it wastes resources and materials, it creates paperwork, it can lead to lost customers. The Waste of Defects should be prevented where possible, better to prevent than to try to detect them, implementation of poka yoke systems and automation can help to prevent defects from occurring

Methods of Lean Manufacturing

The methods/tools used in the lean manufacturing are as shown below

5S

Sort (Seiri)

- Segregating the various activities of a production unit into groups.
- Make work easier by eliminating obstacles.
- Reduce chances of being disturbed with unnecessary items.
- Prevent accumulation of unnecessary items.
- Evaluate necessary items with regard to cost or other factors.
- Remove all parts or tools that are not in use.
- Segregate unwanted material from the workplace.
- Define Red-Tag area to place unnecessary items that cannot immediately be disposed of. Dispose of these items when possible.
- Need fully skilled supervisor for checking on a regular basis.
- Waste removal.
- Make clear all working floor except using material.

Set in Order (Seiton)

- Arranging the sorted-out groups in a proper sequence
- Arrange all necessary items so that they can be easily selected for use.
- Prevent loss and waste of time by arranging work station in such a way that all tooling / equipment is in close proximity.
- Make it easy to find and pick up necessary items.
- Ensure first-in-first-out FIFO basis.
- Make workflow smooth and easy.
- All of the above work should be done on a regular basis.
- Maintain safety.
- Place components according to their uses, with the frequently used components being nearest to the work place.

Shine (Seiso)

- Maintenance of the entire production unit. cleaning and maintain position in good conditions the entire unit
- Clean your workplace on daily basis completely or set cleaning frequency
- Use cleaning as inspection.
- Prevent machinery and equipment deterioration.
- Keep workplace safe and easy to work.
- Keep workplace clean and pleasing to work in.
- When in place, anyone not familiar to the environment must be able to detect any problems within 50 feet (15 meter) in 5 seconds.

Standardize (Seiketsu)

- Standardize the best practices in the work area.
- Maintain high standards in workplace organization at all times.

- Maintain orderliness. Maintain everything in order and according to its standard.
- Everything in its right place.
- Every process has a standard.

Sustain (Shitsuke)

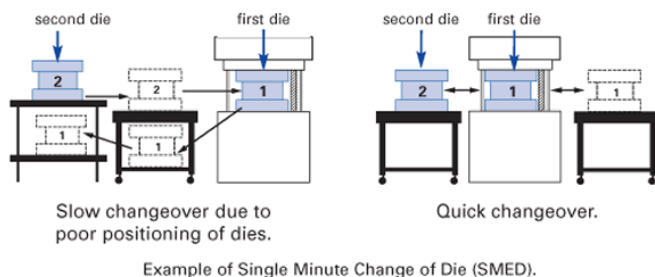
- Not harmful to anyone.
- Also translates as "do without being told".
- Perform regular audits.
- Training and discipline.
- Training is goal-oriented process. Its resulting feedback is necessary monthly.

TPM (total productive maintenance)

The main objective of this method is to increase the efficiency and productivity of machinery and equipment by: a marked decrease the number of failures, reducing the time retooling and adjusting machines and short downtimes and idle (caused frequently absent employee, or waiting for the tools, material, information, etc.), reducing defects in product quality, decreased time spent on start-up of production

Single minute exchange of dies

It focuses on rapid changeover from one product to other product. Single Minute Exchange of Dies (SMED) system, developed by Shingo (1985) to dramatically reduce or eliminate changeover time. The four-step changeover improvement process is used to help companies design no/low cost solutions to reduce changeover time. Companies that used SMED tools to ensure that changeovers are quick and relatively simple are typically much more agile: they can quickly change production operations to satisfy changing customer requirements. The SMED process focuses on reduction of setup and changeover time as a way of improving utilization of resources, increasing capacity and more volume.



Cellular manufacturing

Cellular manufacturing is a process of manufacturing which is a subsection of just-in-time manufacturing and lean manufacturing encompassing group technology. The goal of cellular manufacturing is to move as quickly as possible, make a wide variety of similar products, while making as little waste as possible. Dividing the entire manufacturing unit into different cell, each cell doing a specific job.

Kanban system A system that uses replenishment signals to simplify inventory management. Signals (usually cards) hold product details. Cards stay attached to a bin that holds the product. When bin is empty, it is returned to the start of the assembly line for replenishment. Full bins are returned to the customer, and the cycle continues

Kaizen

Kaizen philosophy is the concept of continuous improvement, which assumes constant search for ideas to improve all areas of the organization. It requires the involvement of all the company's employees, operators, up to the highest level of management. The aim of Kaizen is permanently replacing waste activities adding value. In practice Kaizen comes to collecting and implementing ideas of employees, which serve to improve the organization of work, or improving the production process

Value stream mapping: Value stream mapping is a lean-management method for analyzing the current state and designing a future state for the series of events that take a product or service from its beginning through to the customer. At Toyota, it is known as "material and information flow mapping". It can be applied to nearly any value chain applications.



Poka yoke: Poka-yoke. Poka-yoke is a Japanese term that means "mistake-proofing" poka-yoke is any mechanism in a lean manufacturing process that helps an equipment operator avoid (yokeru) mistakes (poka) The concept was formalised, and the term adopted, by Shigeo Shingo as part of the Toyota Production System. It was originally described as baka-yoke but as this means "fool-proofing" (or "idiot-proofing") the name was changed to the milder poka yoke

Advantages

- Increased overall productivity
- Reduced amount of floor space required
- Reduced manufacturing lead time
- Improved quality

Disadvantages

- Difficulty involved with changing processes to implement lean principle
- Long term commitment required

CONCLUSION

It is evident that the lean manufacturing technique plays a key role in improving the productivity of the manufacturing unit. Implementing Lean principles in any process will bring huge results to organizations. Eliminating Non Value Adding activities in any process can bring huge results. The result achieved in this study indicates that if the lean concepts are organized in all departments, they would generate very significant organizational benefits.

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How to cite this article:

Prakash B Ramanna Bandi et al.2018, Methods Used In Lean Manufacturing To Improve The Production Process. *Int J Recent Sci Res.* 9(6), pp. 27240-27243. DOI: <http://dx.doi.org/10.24327/ijrsr.2018.0906.2218>
