

Production Improvement Using Lean Techniques in Pump Industry

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Abstract: Traditionally operated manufacturing industries are facing lot of problems which includes manufacturing cost, longer manufacturing lead time, and quality of the product and customer satisfaction. Even though the lean tool has proven the process improvement consistently, SME's are not focused much on lean manufacturing philosophies. In this research work carried out in manufacturing industry, by improving productivity and process performance through lean tools such as bottleneck analysis, value stream mapping, kaizen and make or buy decision are used to identify the different problems and to address the variety of solutions. Loading and unloading time can be reduced by using kaizen tool, so that the productivity has been increased.

Keywords: Production improvement.

1. Introduction

In this competing market industries are using some best techniques to produce good quality products at the pull of the customer. To deliver their products or materials quickly at low cost and best quality by applying lean manufacturing principle and techniques. Lean manufacturing is systematic method originating in Japanese manufacturing for minimization of waste within manufacturing system without sacrificing productivity which can close the problem (Muda) (Non-value adding work), Lean also takes into account waste create through overburden (Muri), Unevenness in work load (Mura). In other word, Lean manufacturing system is a philosophy or concept that aim to improve productivity and reduce waste. Lean thinking improve operating performance by focusing on the process, products, materials or service through the value stream. Waste includes any activity, process that does not add value to the customer. For the critical case study, we selected a pump industry in Coimbatore and the industries having batch production of submersible pump. This paper is a case study explaining about the successful implementation of lean manufacturing tools and techniques in the manufacturing system at the industry and the outcomes were illustrated and discussed.

2. Literature Review

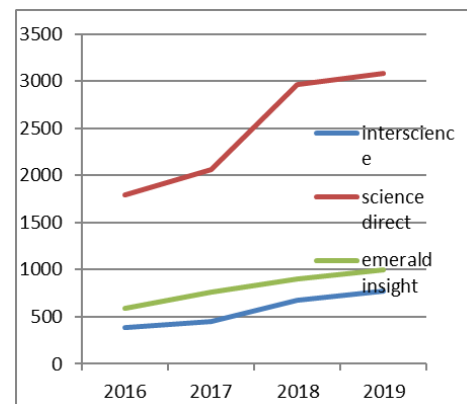
Literature snapshot on implementing lean principle in a product manufacturing including,

A. Data bases identified

1. Inderscience.com
2. Emeraldinsight.com
3. Taylorandfrancis.com
4. Sciencedirect.com
5. Interscience.com
6. Elsevier.com
7. Wiley.com
8. Doaj.com
9. Openaccessjournals.com
10. Sage.com
11. Asq.com
12. Asme.com

B. Time period

Data base	2016	2017	2018	2019
Inderscience	389	451	679	772
Science direct	1790	2063	2964	3077
Emerald insight	594	762	899	1000



Segregation of literature:

1. An investigation on lean manufacturing system in submersible pump industries.
2. Lean implementation through enhancing productivity in a pump industry
3. Manufacturing lead time reduction in monoblock pump industry.
4. Implementation of lean manufacturing in centrifugal pump.

5. Lean manufacturing through value stream mapping.
6. Manufacturing enhancement through reduction of cycle time using different lean techniques.
7. Product and process improvement using simulation based value stream mapping.
8. Lean tools execution in a small scale manufacturing industry for productivity improvement.

C. Literature reviews

1. The author said in order to handle the critical situation for competitive environment, manufacturing are trying to implement new and innovative techniques in their manufacturing process by making it more effective and efficient.
2. The author takes a survey of how lean manufacturing is used in pump industry and what are the waste that are eliminated by the industry.
3. By implementing the lean manufacturing the production of the pump set has increased from 3200 to 8000.
4. Application of this lean tools which eliminates inventory which in turn reduces the lead time from 14.60 days to 13.60 days and value steam mapping to map the present and future state.
5. Uses of lean manufacturing techniques in reducing waste and a 35% reduction in through put time is achieved to increase the productivity in a pump manufacturing company.
6. Aravind kumar used kaizen as a lean tools in pump industry. In this literature we can understand that the organization provides a frame work for people to get involved in the endeavour of continuous improvement.
7. Parthiban used value stream mapping and line balancing as a lean tool in pump industry. In this literature we can understand that to improve the productivity by separating value added time and non-value added time to reduce lead time.
8. Mohit B. Diwan defined the waste as MUDA a japanese word for eliminating the non-value added activities to improve operating performance by focusing on the process, product, material or services through the value stream.

3. Lean Manufacturing

The principles of lean where first introduced in the book that changed the world by James P. Womack, Daniel D. Jones and Daniel Roos. The author studied several manufacturing system and wrote the book on their observations at Toyota. In Toyota they used the lean manufacturing to improve the factors that add value and reduce what is wasted on all other factor. This philosophy is arrived largely from the Toyota production system and identified as "LEAN" only in the 1990's.

Lean manufacturing is a technique which focuses on the customer needs and fulfils it by delivering the requirements at

less time with quality and cheaper cost through eliminating all kind of hidden wastes that present in the companies by continuous improvement. The implementation of lean manufacturing techniques in the company will result in higher productivity with less lead time.

A. Lean tools used

- Value Stream Mapping
- Overall Equipment Effectiveness
- KAIZEN
- Just in Time
- Cellular Technology
- Supply chain integration

B. Value stream mapping

It is learned that in lean manufacturing value stream mapping is the most powerful tool. In this VSM is a tool commonly used in lean continuous improvement to help to understand the current state of any process and also improve the flow of material and information among organizations or departments. It captures and presents the whole process from inspection to completion, by a method which is easy to understand by those working on the process it captures the current issues and gives a realistic picture. The value stream mapping starts with the creation of the current state map of the process. The map is drawn using standard icons which represent different steps in process, inventory, production, transfer, operators, and others. The entire process is mapped from raw material receipt on the left-hand side to customer shipment on the right-hand side. The final step is to add lines to the bottom of the map that distinguishes from value added to non-value added activity. Value added is anything in the process for which the customer is willing to pay for. Non-value added activity is a waste. For this particular project, the current state and future state value stream mapping have been done.

1) Implementation of VSM

Visualization of tool oriented to the Toyota version of lean manufacturing (Toyota production system), is value stream mapping that assists a manufacturing company to understand or record current lead time, understand the inventory levels and cycle times to determine the ratio of value added to the total lead time of the assembly time which is analyzed. The first action taken is to create a current state map to make a representation of the production flow and learn the companies existing cycle times, communication flow, and also the capacity of the machine. By their step we get the required information for the production of future state maps by creating an image of an ideal product flow, this is not the end of a complete study. The aim is to identify and remove the waste.

The value stream process will help to expose that a Substantial amount of non-value-added activities are present in the manufacturing process. These activities consume longer lead time without any adding value. Nonetheless, some of these activities are necessary for the process, So the idea is to maintain their impact. For the purpose of improving the flow of

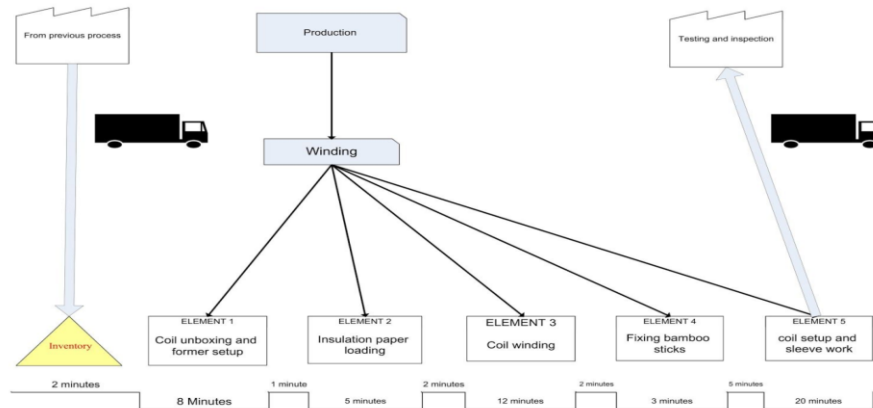


Fig. 1. Existing VSM in an industry

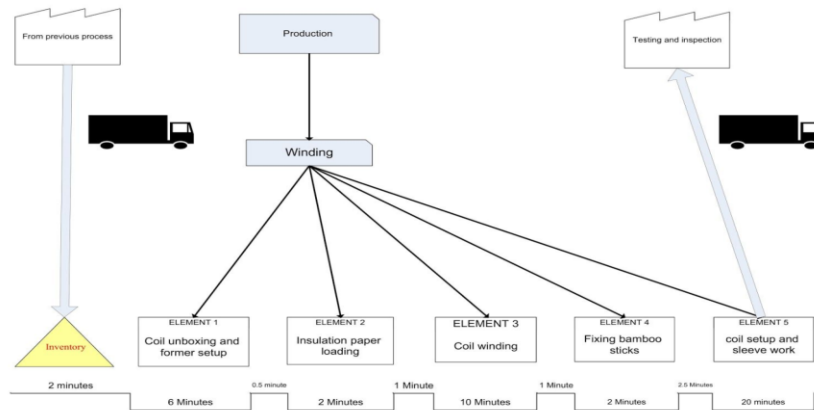


Fig. 2. Improved VSM in an industry

work in process inventory and information, Value Stream Mapping a special type of flowchart that uses symbols which is called the "language of lean" is utilized. It provides optimal value to the customer, through a complete value creation process with minimum lead time.

C. Application of lean manufacturing

1. Pump industries
2. Automobile industries
3. Food and beverage industries
4. Plastic industry
5. Fashion industry
6. Foot wear industry
7. Additive manufacturing
8. Sand casting
9. Healthcare organization
10. Aerospace industry

4. Conclusion

We have identified a problem in one of the leading pump industry in Coimbatore. The majority of the pump industry

faced the problem of production lag in winding section, since it is the bottleneck part of the overall manufacturing. The collected database on lean techniques are one such tool to improve the productivity in the pump industry. The major part of VSM was carried out in the winding section of the industry.

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