

Fundamentals of lean manufacturing and its importance in the manufacturing industry

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Abstract

The key to success in business is to optimize the use of available resources by eliminating all the waste which lowers efficiency. Lean manufacturing is a very effective methodology in removing waste from production processes and improving productivity. It can be applied in any type of manufacturing industry and provides significant improvements. The paper discusses the fundamentals of lean manufacturing and its importance for productivity improvement of the manufacturing industry.

Keywords Productivity improvement, Lean tools, Lean manufacturing, Waste minimization

1 Introduction

Lean is a continuous improvement concept that grew out of the Toyota Production System in the mid of the 20th century. It gives preference to the customer's view on value and focuses on the continuous improvement of the way in which value is delivered by eliminating the hidden waste from the work processes. It recognizes every activity in the work process which is not adding value to the product from the customer's perspective as waste and these activities are termed as non-value added activities.

Lean manufacturing ensures the smooth and continuous flow of the work in the production process. It targets every congestion or barrier in the flow of work which results in waste. For this purpose, various lean tools are available which can map the entire production process with an aim of finding waste at different stages of the production.

2 Five principles of lean manufacturing

The five principles of lean manufacturing are used as the basis for lean implementation and are listed below:

2.1 Recognize value from the customer's viewpoint:

It is very important for any manufacturing industry that it must identify what is the requirement of the customer and what are the expectations of the customer from the product. Based on that data the value addition process should be designed. Any effort made in the business which is not recognized by the customer or the customer is not willing to pay for that effort then that effort is purely a waste for the industry. All the resources used for that effort will be wasted because they are not used to add value to the product. So it is necessary that the value of the product must be identified from the customer's point of view.

2.2 Value stream mapping:

Based on the data collected in the previous step related to the customer's view on value, the mapping of the existing value addition should be done. In this step, the complete process of the production undergoes a thorough evaluation in order to find the waste or the non-value added activities.

2.3 Flow creation:

This step ensures the smooth flow of the material and information in the production process without any congestion or barrier. Continuous and smooth flow is required in the production process right from the order acceptance to the delivery of the order. It is a very important exercise for the elimination of waste in the production process. The integration of all the activities must be ensured in order to achieve a streamlined workflow.

2.4 Pull system establishment:

Lean manufacturing believes in the pull system over the push system. In the push system, the demand is forecasted and based on that forecasting the inventory is maintained. But due to certain fluctuations in the demand or the error in the forecasting it often results in either excess inventory or low inventory situations which ultimately give rise to different forms of waste in the production process. But the lean concept is totally based on the pull system. In this system the inventory is totally based on the demand, no inventory is generated unless demand arises. It requires detailed information about the demand of the customer to work smoothly and this system shows lesser fluctuations and thus lesser possibilities of waste than the push system.

2.5 Continuous improvements for perfection:

Lean manufacturing focuses on continuous improvement strategy. The process must be reviewed on a continuous basis even after achieving certain improvements because the lean concept believes that there is always a scope of improvement or finding hidden waste from the production processes.

3 Eight wastes of lean production

Lean manufacturing focuses on eight types of wastes in the production system. Every lean tool tries to eliminate one or more of these wastes during the implementation phase. These eight forms of waste are below:

3.1 Transportation

It includes any unnecessary movement of raw materials, work in process, and finished product. This basically arises from unplanned work and it results in wastages of the resources used during the transportation process.

3.2 Inventory

It includes the raw materials, work in process and finished products stored in quantities more than the requirements. Anything more than the requirement requires storage and that will give rise to different forms of waste due to unnecessary use of the available resources used in the unnecessary storage of the excess materials.

3.3 Overproduction

It includes the excess production of products than the actual order from the customer. It directly leads to inventory problem due to the unnecessary storage of the excess goods which are waiting for its delivery to the customer and which further give rise to many hidden wastes.

3.4 Waiting

It includes the work in progress waiting for its next processing stage. It is also a serious form of waste because it gives rise to the inventory of the industry which results in the wastage of many types of resources used for storage purposes.

3.5 Motion

It includes the unnecessary movements of the parts or the workers during the work processes. This further leads to the wastage of worker energy, resources, and generation of idle time in the production process.

3.6 Over Processing

It includes the excess use of the available resources during the process of value addition to the product as per customer demand. If particular value addition is done by using excess resources than required or by taking more processing time than the standard limits then that value addition process comes under the over-processing category and it is very difficult to identify in the production system. This requires a thorough study of the existing operations.

3.7 Defects

It includes the rework and the scrap products due to non-confirmation to the quality demanded by the customer. It results in wastage of the resources used for the production of such products.

4 Conclusion

Lean manufacturing is a continuous improvement concept that provides a sound methodology to identify the different forms of waste hidden in the production system of any manufacturing industry. It gives preference to the customer's viewpoint on the value of the product and guides the industries to generate the demanded value through optimized use of available resources without any waste. Most of the industries use lean concepts to improve the efficiency of its production system which ultimately results in productivity

improvement. It is necessary for the manufacturing industries that they must adopt the lean concepts in its production system in order to have a sound and longer stay in today's competitive market.

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