

AN APPLICATION OF LEAN MANUFACTURING PRINCIPLE IN AUTOMOTIVE INDUSTRY

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ABSTRACT: Nowadays the automotive industry is facing various problems because of changing global scenario in terms of high quality expectation, reduced cost of production and increased productivity. All the companies are in the motive to solve these problems through the application of modern techniques. This project attempts to provide an effective solution for these problems through lean manufacturing techniques. The key objective of this project is to eliminate the wastes and cost of production and to increase the quality and productivity through shorter lead time and increased value added activities. This project deals with collection of the time taken for each processes and the bottleneck operations have been identified and a current state of value stream map was developed. The suggestions were made by identifying and implementing various improvements in processes, also to develop the future state value stream map for further improvements to achieve the objectives of this project.

Keywords-lean, taken time, value stream map, future state map

1. INTRODUCTION

In modern era, the companies are facing stiff competition and pressure to perform competitively. This new age will be the challenge for the companies to provide, exciting, innovative and cost effective products in the market. To survive, a company has to offer best prices to its customers with high quality, service and operate with lowest cost. It is only possible for a company if all of its departments are well managed.

2. BACKGROUND

The major of this project is to analyze the current situation of the company, whether the company using its manufacturing equipment's in a proper way to get the competitive advantages? If not, figuring out the main cause for that and look into the problem exists within the company i.e. lack of availability of resources or poor quality or lack of performance efficiency, and how these problems influence the company in achieving its goals.

The company cannot compete in the competitive market unless it uses its resources and capabilities to the maximum extent. The company must work to get rid of the problems to get the competitive advantages with respect to cost, service, and quality and on time delivery. These issues do not allow the company to achieve its set goals.

Problem Formulation

- To investigate the current situation of the production of the company.
- To pick up the weakening in the production system those do not allow the company to achieve its full capacity and meet the set goals.
- To suggest the ways to improve the situation.
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3. OBJECTIVE OF THE PROJECT

In today's scenario the automotive suppliers have a great concern over improving quality and delivery and decreasing cost, which leads to improved system productivity. In order to remain competitive, waste from the value stream must be identified and eliminated so to run system with maximum efficiencies.

A Production is to order and large numbers of different products are produced, each in relatively small volume. A Production shop consists of number of machine centers, each with a fundamentally different activity.

The problems of machine shop are delayed deliveries, long queues, and high work in process inventories, improper utilization. These problems increase overall cost of production. The need for customized products/parts with reduced lead times together with the requirement of global competitiveness requires that products/parts be produced in small batch sizes as per customer's requirement. The processing in small batch sizes necessitates the adjustment in the flow of production through different processes as per their processing speeds. In addition it requires close monitoring of processes to reduce process variability (defect free production), efficient planned maintenance of all machines (for increased availability) and reduction in non-value added activities such as setup times, movement of material in between the work processes and additional processing of material. The efficient utilization of machines while producing in small batches reduced WIP inventories, reduced times and reduction in lead times leads to competitive manufacturing. It is need for machine shop manufacturing system to adopt lean environment.

To improve productivity by identifying waste and then removing that by implementing lean principle in this industry. Value Stream Mapping enables a company to identify and eliminate waste, thereby streamlining work processes, cutting lead times, reducing costs and increasing quality and hence productivity. The goal of VSM is to identify, demonstrate and decrease waste in the process, highlighting the opportunities for improvement that will most significantly impact the overall production system. In this project lean concepts are introduced using VSM in working environment.

4. VALUE STREAM MAPPING

A value stream map is an end-to-end collection of processes/activities that creates value for the customer. A value stream usually includes people, tools and technologies, physical facilities, communication channels and policies and procedures. A value stream is all the actions (both value added and non-value added) currently required to bring a product through the main flows essential to every product: (a) the production flow from raw material into the hands of the customer, and (b) the design flow from concept to launch. Standard terminology, symbols, and improvement methods allows VSM to be used as a communication tool for both internal communication and sharing techniques and results with the larger lean community's is the process of visually mapping the flow of information and material as they are preparing a future state map with better methods and performance. It helps to visualize the station cycle times, inventory at each stage, manpower and information flow across the supply chain.

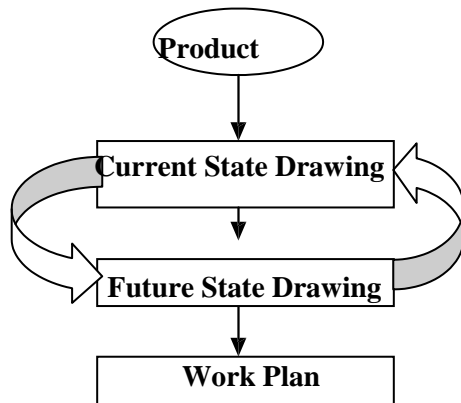
5. VSM METHODOLOGY

To start improving productivity by identifying waste and then removing it by implementing lean principle in the industry there is no other tool better than VSM. It helps to understand and streamline work processes using the tools and techniques of Lean Manufacturing.

The goal of VSM is to identify, demonstrate and decrease waste in the process. Waste being any activity that does not add value to the final product, often used to demonstrate and decrease the amount of 'waste' in a manufacturing system. VSM can thus serve as a blue print for Lean Manufacturing.

Generally VSM has four major steps as given by Rother and Shook (1996):

1. Product
2. Drawing current state
3. Drawing future state
4. Develop work plan for implementation of future state.



Identification of Bottleneck operations

There are many methods to find out the bottleneck operations. Some of the commonly used methods are shown below

- Most Rejection(or) High Breakdown
- Time Over (More Setup Time)/Tool Changeover
- Cycle Time is greater than Taken time.
- More Cycle Time
- Lowest Output.
- Oldest Machine
- Cycle time Calculation

Figure 1 & Figure 2 shows the current and future maps

$$\begin{aligned} \text{Taken time} &= \text{Available time/ customer demand} \\ &= 27 * 880 * 60 / 50000 \\ &= 28.5 \text{ sec.} \end{aligned}$$

Number of shifts per day = 2,

Number of working days = 27

Networking time per day = 880 min.

Demand for month = 50000

Cycle time = 29 sec

Lead time = 6 sec

Production per day = $880 * 60 / (29 + 6) = 1508$ parts per day

6. RESULTS & DISCUSSION

Nowadays many companies are interested in improving their production system. It has become important in globalized and competitive market for the company's survival. The companies are looking into their production systems in the different directions to get the competitive advantages. But the most important is to find out the problem of the production system to make improvements

When cycle time for each process is compared with taken time it is found that cycle time of welding process exceeds the taken time so there is need to improve the process capability of welding process to meet the demand of customer within the time.

So it can be improved by using various lean tools but here we are improving the cycle time of welding process by introducing a new welding machine and by improving layout of weld shop.

Cycle time before improvement = 29sec.

Cycle time after improvement = 15sec.

Percentage of improvement in production = $(2514 - 1508)/1508$

There is near about 66% improvement by improvement in value adding activities.

7. CONCLUSION

This project was given the chance to know what the best techniques that they can apply which will improve their performance. Calculating the cycle time also give the company where they are and where is the weakness point and how to improve. From the calculated cycle time, the following were identified non value added activities like high cycle time, more waiting time and Low productivity.

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