

A Study on Reduction of Non-Value Added Activities in An Assembly Line of An Automobile Industry

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Abstract—The main objective of this paper concentrates on the implementation of kaizen activities, lean philosophy in assembly section of the automobile industry and to eliminate the non-value added activities present in the assembly section. This paper describes an application of value stream mapping and kaizen activities. The present and future states of value stream map are constructed to progress the production process by reducing the non-value added activities which are identified from the VSM. Cellular layout is suggested as the kaizen activity to reduce the major non-value added activities in the assembly line of an industry that cause the loss and it will affect excess cost on the industry and also customer dissatisfaction. Industry will bleed if more non-value added activities are carried out. Value stream mapping is one of the lean implementation used to find out the NVA and suggestion has been given to overcome from those NVA.

Keywords—Non-value added activities, Value stream mapping (VSM) and Kaizen activities.

I. INTRODUCTION

Value can simply be defined as something a customer is eager to pay for the product to receive. If a customer is not willing to pay for it, then there is no value. Anything or anyone who does not add/increase value is waste. Non-value added activities that consume time, resources, space but do not add project value. This term NVA is classified as waste in the language of lean production. Non value added activities are wasted effort that could have been avoided if the process had been more carefully planned, executed, monitored & controlled. When non-value-added activities are found, they should be removed whenever conceivable. Time to delivery is one of the major competitive concerns in today's business environment. Among that one promising method for addressing this problem is the application of lean manufacturing principles and techniques. Lean principles came from Japanese manufacturing industry. Lean Manufacturing is a systematic approach to reduce waste present in the production process. The principles of 'lean' focus on reducing non-value added activities in a process while maximizing the production efficiency. Lean Manufacturing focused on pinpointing the major sources of waste and then using various Lean tools to eliminate those waste. Elimination of non-value added activity is addressing the process of reduction in various manufacturing steps. Elimination of manufacturing wastage and implementation of proper lean tool is the major goal of this paper. Value

stream mapping (VSM) is two types' namely current state VSM (CSVSM) and future state VSM (FSVSM). First CSVSM is used to plot the existing state of excavator assembly line process. This map is then used to identify sources of waste present in the plotted process. And it tries to identify lean tools for reducing those wastes. A future state map is then developed for the system with lean tools applied to it for eliminate those wastages. The ultimate goal of VSM is to identify all types of waste present in the value stream and to take necessary steps to eliminate the waste. A variety of techniques exists to support these activities which include value stream mapping (VSM), kaizen activities. Volvo construction and equipment is one of automobile manufacturing industry in India which produces excavators and road machineries. This manufacturing industry having excavator assembly line. Absence of lean in this firm was creating more number of non-value added activities. The industry was unable to process the entire customer order due to the presence of high takt time.

II. PROBLEM DEFINITION

The automobile industry is currently producing 70-80 products per month, but it has the average customer order of 100 products per month. The industry was unable to process the entire customer order due to the presence of high takt time. This was the problem present in the industry.

III. METHODOLOGY

To reduce the time taken in the assembly process and to avoid non value added activities is the primary goal of this project. Which is done by utilizing the various Lean tools and the other lean techniques to remove the NVA activity present in the selected process. The methodology followed in this project is shown below in Fig. 1

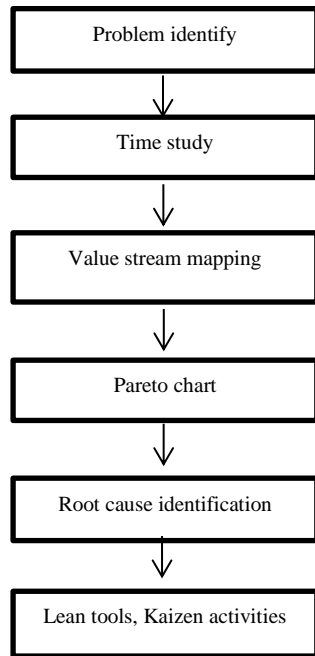


Fig. 1 Methodology flow chart

IV. DATA COLLECTION

Time taken for total process time is calculated firstly and activities are found out along percentage calculation and Identification of non-value added activities are got through value stream mapping

- Value added activities of 43%
- Non-value added activities of 51%
- loss of about 6%

V. ANALYSIS

Current state VSM (CSVSM) is the basic Lean tools which are utilized to plot the existing values and used to identify the various Non-Value added (NVA) activity present in the system. The current state VSM (CSVSM) is created using a predefined set of standardized icons it, is a mapping tool that is used to map the entire production process.

Table 1: Current VSM summary

Takt time	100 min
Value Added Time	43 min
Non value added time	51 min
Loss	6 min

From the above Pareto chart, I can easily say that the major two non-value added activities are found as Lifting/Picking and Moving/Walking.

VII. LEAN TOOLS SELECTION AND LEAN IMPLEMENTATION WORK

Lean tools selection based on types of non -value added activities (NVA) and lean manufacturing related journals.

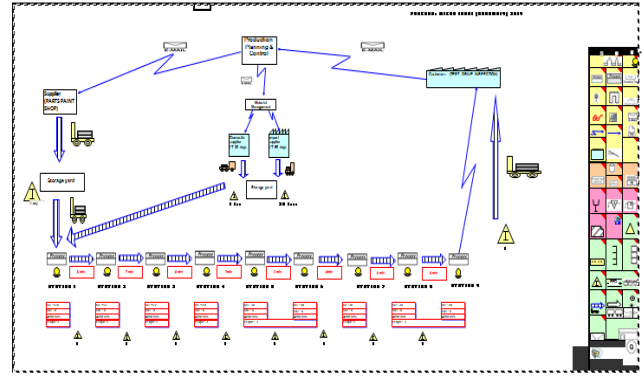


Fig.2 current state value stream map

VI. PARETO CHART

In this particular step the detailed analysis of the current state map is done and then defining the opportunities for improvement is done. The Pareto chart is made to analyze the current state of the excavator assembly line in the industry.

Table 3: Non-value added activities

Sl.NO.	Non-value added activities	Frequency	Cummulative frequency	Percentage
1	Lifting/Picking	39	39	20.63
2	Moving/Walking	29	68	35.97
3	Transportation	29	97	51.32
4	Modification/Adjusting	25	122	64.55
5	Meeting/Discussion	21	143	75.66
6	Packing/unpacking	15	158	83.59
7	Waiting	10	168	88.88
8	Inspection/Measure	8	176	93.12
9	Jig/Tools Change	7	183	96.82
10	Cleaning	5	188	99.47
11	Repairing	1	189	100
12	Stopping	0	189	100
13	SS/AM	0	189	100
		189		

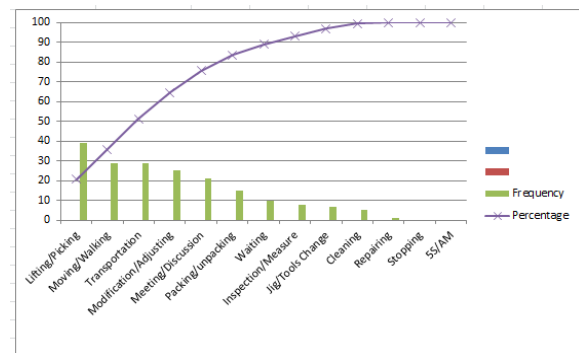


Figure 3: Pareto chart of non-value added activities

- Kaizen activities
 - Proper Training to operators
 - Automatic guided vehicles
 - Cellular layout
- Kaizen suggestions
 - Automated robotic process
 - Suspended pneumatic gun

By implementing the kaizen activities in the assembly line of the automobile industry cellular layout is opted as the

best kaizen activity by comparing and analyzing with other kaizen activities.

VIII. VALUE STREAM MAPPING - FUTURE STATE

After lean implementation in assembly section time study had taken in all stages. Based on the time study future state map created. Future state mapping for cellular layout is below shown in Fig 4 and Table 4 shows result of future state values.

Table 4: Future VSM summary

Takt time	80 min
Value Added Time	43 min
Non value added time	31 min
loss	6 min

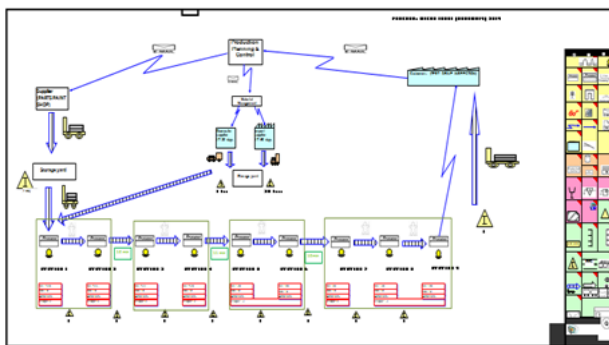


Fig.4. Future state value stream map

IX. RESULTS AND DISCUSSION

The takt time for automobile assembly section has been reduced by implementing lean techniques. The takt time before implementing lean principles is 100 min. This time has been reduced to 80 min.

X. CONCLUSION

The implementation of lean concepts in automobile assembly section has brought out the following changes.

- The productivity of the assembly section has been increased considerably.

- The motion waste and lifting/ moving waste has also been eliminated.
- Reduction in takt time

XI. FUTURE WORK

Cellular layout with automated guided vehicles in moving the object or parts will results in further more reduction in motion and also time. As the kaizen suggestions, Automated robotic process and Suspended pneumatic gun can be implement for future work as those suggestions but results in high cost.

XII. REFERENCES

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