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VALUE STREAM MAPPING FROM DOCK TO STOCK OPERATIONAL ACTIVITY AT ENGINE MANUFACTURING PLANT

***Jayant K. Nalawade and Satpute, S. T.**

Department of Automobile Engineering Rajarambapu Institute of Technology, Rajaramnagar, Islampur - 415 409, Maharashtra, India

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ABSTRACT

Studies on application of value stream mapping at automotive industry and the focus is on Dock to Stock process at Engine manufacturing plant is limited. This paper addresses the application of value stream mapping as one of the lean tools to eliminate the waste and improved operational procedures and productivity. In this approach, value stream mapping (VSM) is first used to map the current operating state for dock to stock operational activities. This map is used to identify sources of waste in the process. Further lean tools are used for reduction in the identified waste. A future state map is then developed for the system with designing lean process flow by reducing waste and process improvements. The implementations of the recommendations are executed. The study reveals that there is improvement in the process by implementing the proposed changes incorporated in future state map.

INTRODUCTION

Lean manufacturing is one of the initiatives that automotive companies have been trying to adopt in order to remain competitive in an increasingly global market. The focus of the approach is on waste reduction by either eliminating or reducing non-value added activities. Originating from the Toyota Production System, many of the tools and techniques of lean manufacturing (e.g., just-in-time (JIT), cellular manufacturing, total productive maintenance, single-minute exchange of dies, production smoothing) have been widely used in manufacturing (Fawaz A. Abdulmalek, 2006). Value stream mapping is also evolved for the same purpose that is making manufacturing "Lean".The value stream is the entire creation process for a product. The value stream starts at concept and ends at delivery to the customer. In understanding the VSM it is important to understand what Value and Value Stream is. Focus on value in the context of what the customer is prepared to pay for (R.M.Belokar, 2012). Hence it is essential to understand what the customer requires in terms of features and performance, and for what they are willing to pay(Yang-Hua Lian, 2002). The customer willing to pay for the activities are called as value added activity and vice versa. The outcome of Value stream mapping gives clear understanding of which products and what features customer prefers.

Corresponding author: Jayant K. Nalawade
Department of Automobile Engineering Rajarambapu Institute of Technology, Rajaramnagar, Islampur - 415 409, Maharashtra, India

Value adding activities

Machining, Processing, Painting, Assembly.

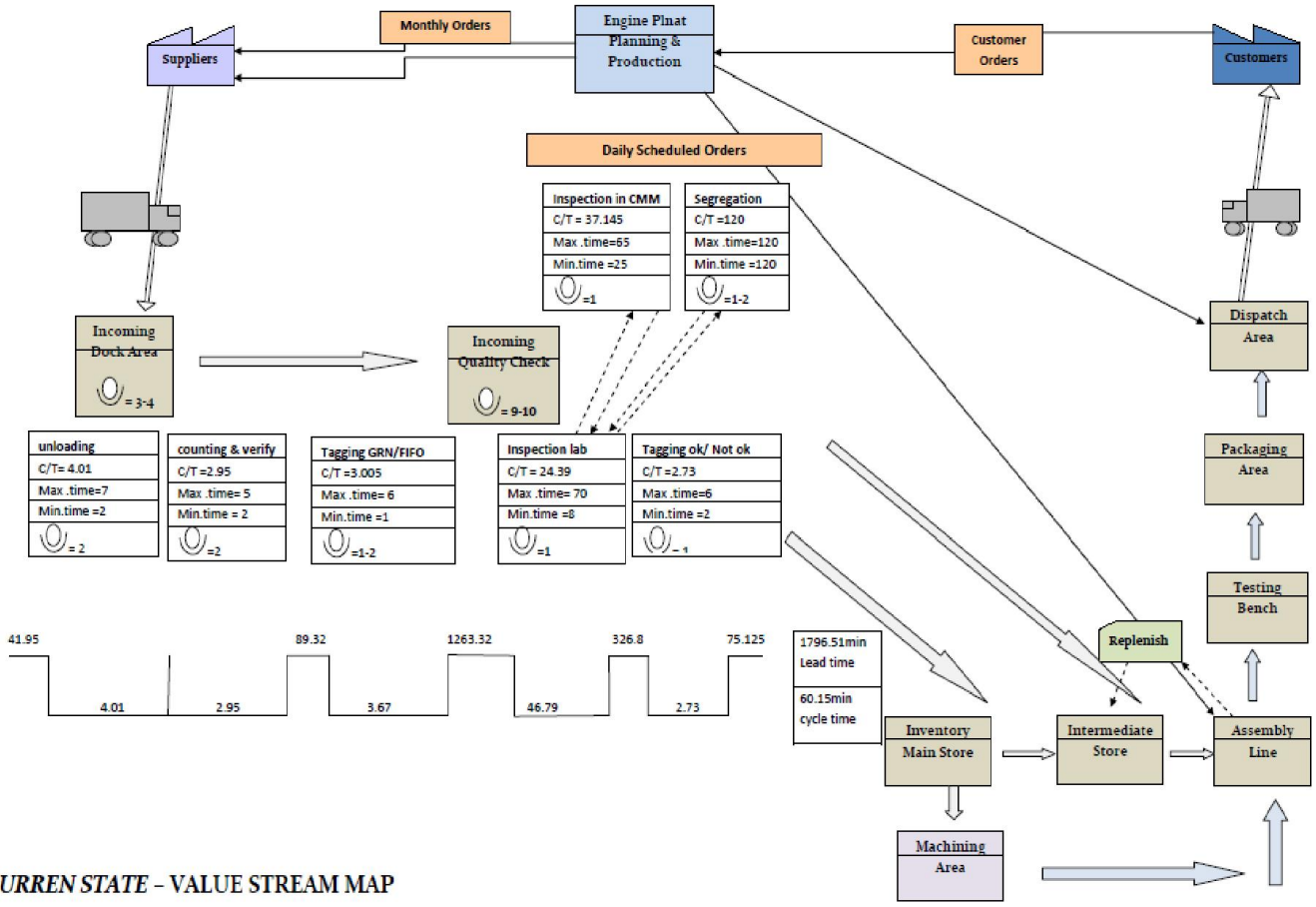
Non value adding activities

Scrapping, sorting, storing, counting, moving, documentation.
Value stream mapping is used to analyze the waste in the process and to take steps to eliminate those waste(Renu Yadav, 2012), Value stream mapping is a set of methods to visually display the operational activities and information through the production process. Value stream maps should reflect what actually happens rather than what is supposed to happen so that opportunities for improvement can be identified. The objective of this research study was to attain lean in the process through waste reduction.

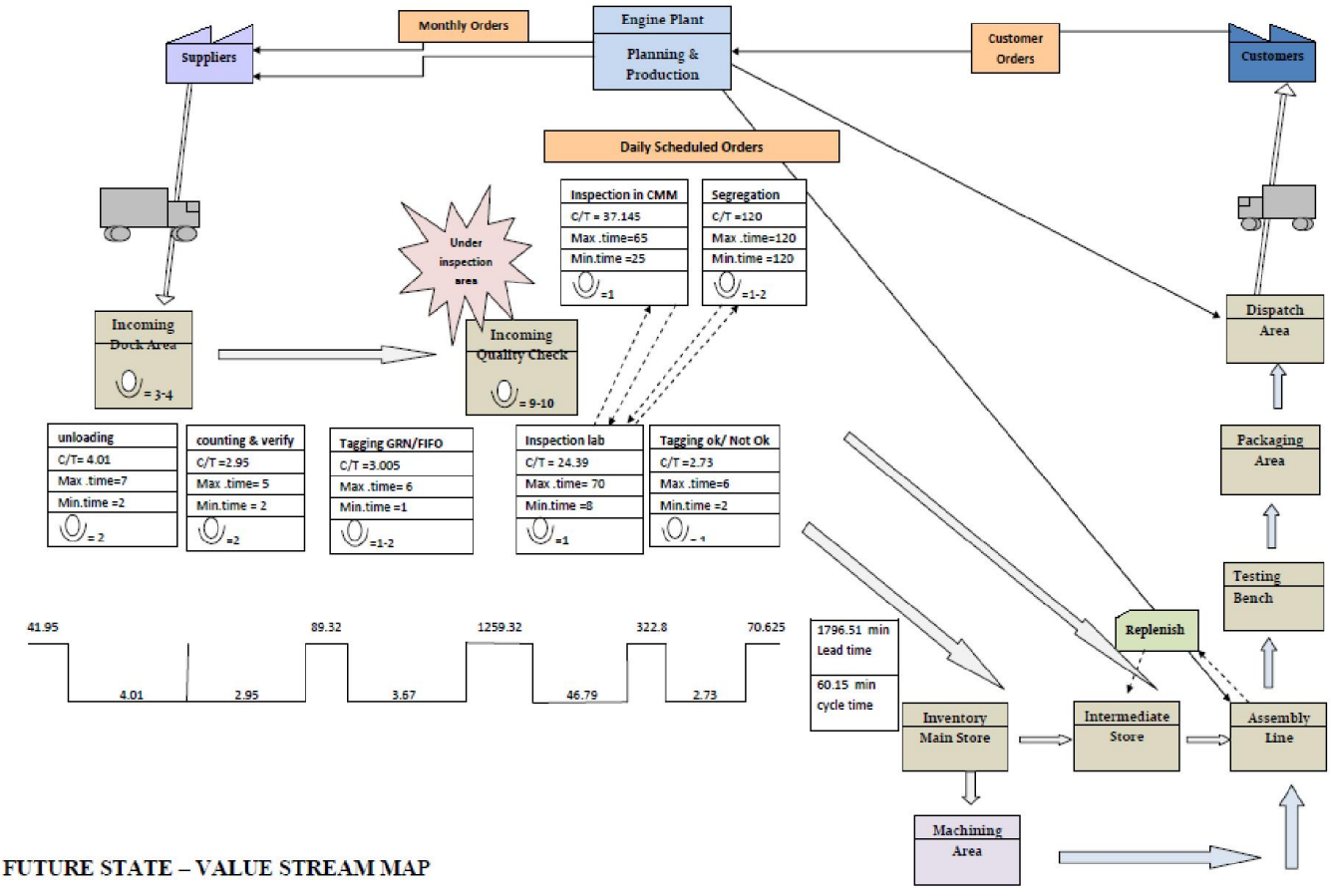
MATERIALS AND METHODS

The Value Stream Mapping (VSM) is a visualization tool oriented to the Toyota version of Lean Manufacturing (Toyota Production System). 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. VSM can thus serve as a blue print for Lean Manufacturing tools (Verma, 2012)(R.M.Belokar, 2012). The procedure can be used as

VALUE STREAM MAPPING



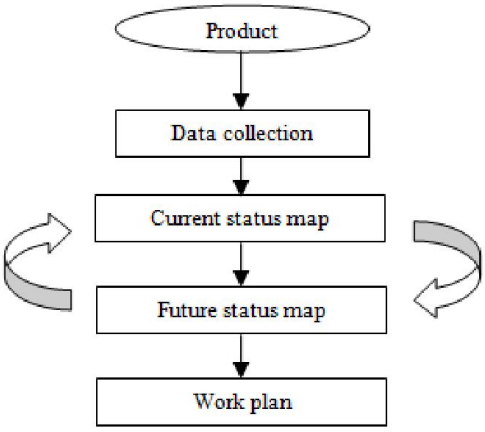
CURREN STATE – VALUE STREAM MAP



FUTURE STATE – VALUE STREAM MAP

continuous improvement process, where future status of first phase becomes current status of second phase.

Following is the general flow chart of VSM tool used previously by (R.M.Belokar, 2012)



VALUE STREAM MAPPING

and their maximum and minimum cycle times. The vision here is to either eliminate non-value added activities or reduce time taken for it. Lean tools are applied for the identified bottlenecks to improve the flow. Identified bottleneck here is under inspection area which become crowded moreover and Searching becomes more difficult and time consuming, is a more concern here. Furthermore for gain from the involving employees the Kaizen workshop is arranged as a part of lean culture and VSM vision. The improvements are selected and implemented for better lean in the flow. Improvements suggested here are to stick the lean as far as possible.

RESULTS

The identification of hidden bottlenecks by VSM and Debottlenecking is done by using the lean tools results in the improved lean flow.

Bottle-neck: Material Storage – Under inspection area
According to principle of 5S the under inspection area is improved

Sr. No	Bottle-neck/NVA	Improvements	Lean tool	Effect on Dock to Stock Activity
1	Crowd of materials at Under inspection area and takes considerable time to find the required material by I/C Quality and store team.	At under inspection area the layout of Rack is changed.	5S	Less time to search the material by I/C Quality and Store team as compared with old layout.
2	The storage of OK stock at under inspection area is more than a day.	QA/32 Standard activity to Move OK stock from Under inspection area to Main store.	Kaizen	The crowd at under inspection area is controlled. Less crowd hence less time to search the material.
3	Tagging activity is NVA.	Some tags are converted into Seal.	Kaizen	Less time compared with old process. Ease of operation, Paper saving, Cost saving.
4	Some parts need CMM for its clearance by I/C Quality dept. and it is NVA.	3 materials which need CMM are excluded for CMM inspection by developing certain techniques by which they can be checked and cleared by I/C quality lab.	Kaizen	Total clearance time to travel from Dock to Stock is reduced as CMM activity is avoided.
5	Some parameters in the inspection report are printed now, that is no need to be written by pen.	Report generating becomes less fatigue and speedy	Kaizen	Less time to prepare the report by I/C Quality team as compared with old process of report generation.
6	DOL activity is started. In this inspection activity is skipped and forwarded to store.	Quality inspection is NVA.	Kaizen	Total clearance time to travel from Quality dept. is reduced as compared to traditional method.

Case Study

A case study is carried out at Engine manufacturing plant. The VSM approach used here is for Dock to Stock operational activity at Engine manufacturing plant. The all activities from Dock to Stock are observed for fifty samples and time taken for each activity are taken. Before it the fifty samples are classified according to consumption of the product, which is Engine here. The process flow chart is prepared. Each samples cycle time, waiting time, transportation time for classified activities are calculated. Number of person working on each station is counted (Renu Yadav, 2012). The data analysis is done by calculating maximum and minimum time for each activity for fifty samples. The value added and non-value added activities are classified. In the Dock to Stock layout all the activities are non-value added. The current state map is plotted and bottlenecks are identified. The future state map is prepared according to action plans.The identification of Bottle-neck is done by carefully studying the material flow

Expected Results: For store team

- Less time required to search for the required materials - Increase in efficiency of Intermediate Store Team.
- Current time Taken – 5-8 minutes/trip
- Expected Time Taken – 2-3 minutes/trip
- Time Saved – 4 minutes/ trip
- Total Time Saved – 40 to 60 minutes (Assuming 10-15 trips from Intermediate Store to Incoming Quality Check Area)

Expected Results: For Quality team

- Less time required to search for the required materials - Increase in efficiency of Quality Team.
- Current time Taken – 5-8 minutes/trip
- Expected Time Taken – 2-3 minutes/trip
- Time Saved – 4 minutes/ trip

- Total Time Saved – 160 to 200 minutes (Assuming 40-50 trips from Intermediate Store to Incoming Quality Check Area)

The hidden bottlenecks and problems associated with flow are exposed at Kaizen workshop to gain from employees (Rahani AR, 2012). Thetable shows the improvements which are implemented over the flow for better lean in the process.

Conclusion

The implementation of VSM improved the approach of Lean production as it identifies the obvious as well as hidden waste from the layout. There is a significant amount of time spent at waiting and non-value added activities at material flow. The results show that the lean tools have an expected impact on reduction of this non-value added activity time. The VSM applied to assess the expected impact of change in the material flow resulted in savings (minimum time to flow from Dock to Stock) and to a certain extent, a positive view is due to the fact that there were substantial gaps between standardized work and real work- this gap means that workers must follow strictly assembly standards and improvising the SOP could be a key driver in continuous improvement sustainability on the production floor as operators are fully aware on the long term commitment to practice lean.

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