VALUE STREAM MAPPING: A CASE STUDY OF AUTOMOTIVE INDUSTRY

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Abstract

Nowadays in a competitive market, companies require small lead times, low costs and high customer service levels. As such, companies pay more effort to reduce lead time. Value Stream Mapping (VSM) techniques are used in some big companies like Toyota. Value Stream Mapping (VSM) is the one of the lean manufacturing tool. This paper addresses the implementation of value stream mapping in automotive industry. Value Stream mapping aim is identified waste in terms of non-value added activities. Current State Map is prepared to give details about the existing position and identify various problem areas. Future State Map is made to show the implementation action plan. A case study carried out in Lear Corporation Halol.

Keywords: *Value Stream Mapping, Lead time, Lean manufacturing tool*

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1. INTRODUCTION

Companies are continually striving to increase productivity and output of their operations. [1] Lean has been originally created and defined as the process of eliminating waste Toyota along with the support a system to reduce or eliminate waste and non-value added activities from the various processes. [3] Value Stream is all the steps, both value added and non value added required taking a product or service from raw material to the customer.[2] Some examples of value added and non value added activities are listed below: Value Added activities-molding, welding etc. Non-value added activities - walking, waiting, inspecting, reworking etc.

Value Stream Mapping is visualization and streamlines work processes using the tools and techniques of Lean Manufacturing.VSM help to identify, demonstrate and decrease waste in the processes. Waste being any activity that does not add value to the final product.VSM can serve as a blue print for Lean Manufacturing.

VSM has three types
1. Process level VSM – In process VSM, material and information flow with in a particular cell or production line.
2. Factory level or door-to-door VSM –In factory level VSM, material and information flow within a four walls of a factory
3. Extended level VSM – Focusing material and information flow of several companies

From this case study we are focusing on factory level or door-to-door VSM

2. LITERATURE REVIEW

R. M. Belokar, Sandeep Singh Kharb, Vikas (2012) Kumar drawn current state map for automobile industry. The tunnel floor is taken for the case study. The cycle time of the welding process is more than the takt time. By changing the layout and improve the process capability of welding process.

Value Stream Mapping is used to identify the current process of small scale industry. The current state map is used to identify the wastes and non-value added activities in the production process. A future state mp is created with the waste activities eliminated and improve process cycle time and reduce work in process inventory. (Rahul R Joshi, G.R.Naik (2012)).Dinesh and A.Prabhukarthi (2013) explain value stream mapping in pump manufacturing industry. They draw current and future state map were developed with the objective if improving productivity according to customer requirements.Florin Buruiana and A.M.Goncalves Coelho have created current state map in shaft manufacturing industry. Draw and analyze the current state map found that the large inventory between two processes, and big difference between total lead times and value added time. Then draw a future state map with providing a supermarket pull system and one work cell and reduced a lead time.

3. VSM METHODOLOGY

VSM has four major steps as given by Rother and Shook. [8]
1. Select a product family
2. Draw Current state map
3. Draw future state map
4. Develop work plan for implementation future state.

4. CASE STUDY

A case study conducted at automotive industry and some of the observations may be useful to engineers in implementing VSM in small, medium and large industries.

4.1 Selection of Product Family

The first step is selection of critical part family. After study of all part families, one part family was selected over all the product families. The frame is main assemblies in a car seat.

4.2 Current State Map

Before draw a current state map collect a require data to draw current state map.

Data collecting method: Method that will be used in collecting data needed is observation to the activities that performed in the shop floor. Data is collected by using a stopwatch.

Table 1: Time matrix for each process

Process Name	Cycle Time (Value Added)	Operator
Cushion Assembly	416	1
Marriage Assembly	265	1
Final Inspection	0	2
FG stock	5190	0

Mapping the value stream always start with the customer demand. To create a current state map following steps are followed.

Step-1 Calculate Takt Time

Takt time is defined as net available time divided by customer demand.

The net available time is the total operation time during a specific period, meaning the total amount of time, which adds value on value stream. Customer Demand can be determined on customer forecast or based on the currently customer order. [9]

Step-2 Understand customer demand

Customer demand based on monthly or weekly. Customer demand is 1778 sets/month.

Step-3 Map the process flow

This step involves various processes to complete the product. In addition, measure relevant data to put in a value stream mapping box. Moreover, see the WIP between two processes.

Step-4 Map the material flow

The flow of material from raw material to finished goods is given by supplier to customer.

Step-5 Map the information flow

The information flow provided demand information. Information are given by electronic or manually.

Step-6 Draw the Time line

Calculate production lead times for inventory triangles by dividing quantity of inventory by the customer daily requirement. [8]
Current State Map shown in Fig 1.

4.3 Future State Map

Analyzing the current state map, the lead time and amount of inventory are more between processes. Supermarket is used between two processes to reduce inventory wastage during process and convert the process from build to stock (push) to make to order (pull). Future State Map shown in Fig 2.

5. SOFTWARE USED TO DRAW VSM

E-Draw Max, Version 7 was used to draw all the maps. E-Draw Max is vector-based diagramming software with rich examples. E-Draw Max software is easy to create flow charts, network-diagrams, chart and graphics, value stream mapping, SWOT diagram etc. E-Draw Max includes all the libraries and examples of E-draw product line.
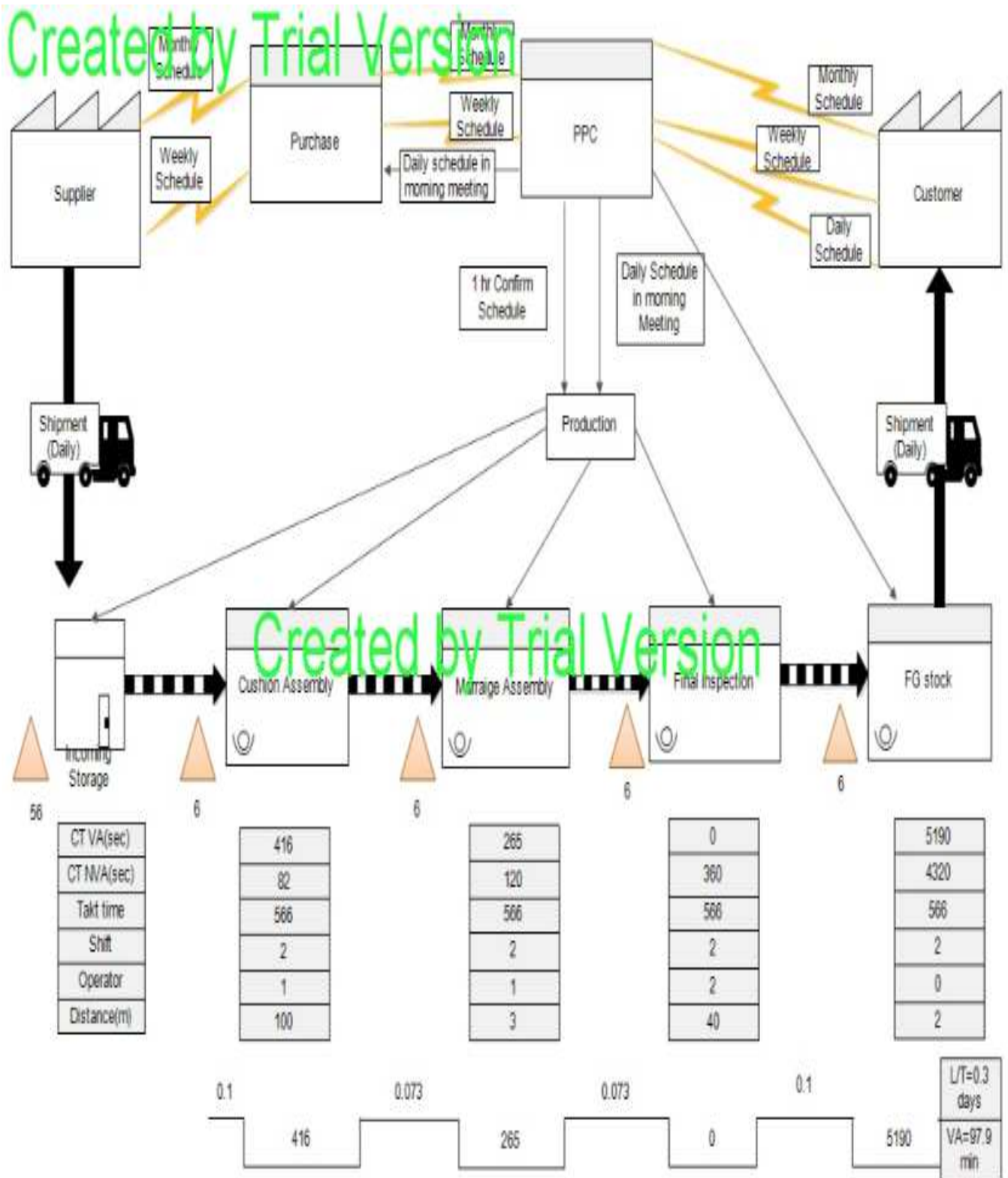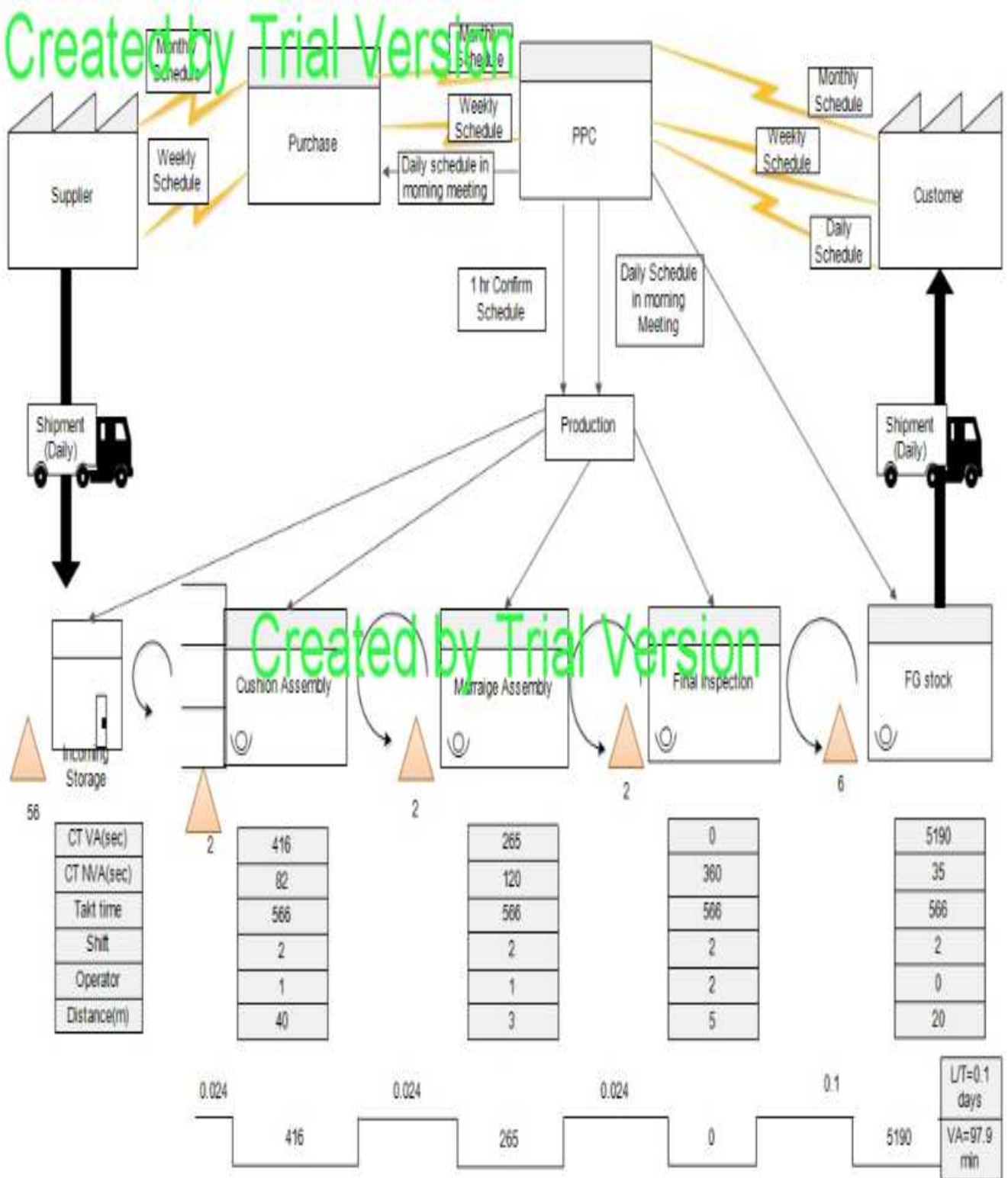
Fig 1:- Current State Map

Fig 2:- Future State Map

6. COMPARISON OF CURRENT STATE MAP AND FUTURE STATE MAP

Variable	Before	After	Improvement
Lead Time	0.3	0.1	66.7%
C/T NVA(sec)	802	597	25.6%
Distance(m)	145	68	53.1%

CONCLUSIONS

By using value stream mapping we observed that non-value added time is reduce by 25.6%.Also,the WIP is reduced and thereby lead time is reduced by 66.7%.This proves the utility of value stream mapping technique..

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