A Case Study on Reducing in Lead Time by Using Value Stream Mapping

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Abstract: In the competitive and economic market, Industries needs shorter lead time, low cost and high customer demand satisfaction. So such industries face cost reduction and efficiency challenges. To sustain and stabilize market industries have to find out ways to reduce production time, cost and elimination of waste to improve operating performance and product quality. Value stream mapping technique maps material flow, information flow, activities and other process elements that are part of supply chain. The visual picture simplifies lean approach by identifying the value-added and non-value added stages. The primary objective of this study is to increase the productivity against the demand. The Quality related issue regarding material & material shortage online is not in the scope of this study. A value stream means working on the big picture, not a just individual process; and not a just optimization but an actual improvement. It covers value adding as well as non-value-adding activities his research shows benefit associated with the implementation of the lean program. This case study shows a manufacturing industry case study.

Keywords: *Production lead time, Value stream mapping, Nonvalue-added time*

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1. INTRODUCTION

Lean manufacturing is a philosophy derived from the Toyota Production System (TPS). TPS is base on waste elimination. Which beliefs in customer satisfaction through continuous improvement (Womack et al. 1990, 1996)[1]. The research study was carried out in a manufacturing industry. The objective is to matching supply and demand of in-house production. For this, to know supply chain losses or nonvalue-added activities is necessary.

•To explore the Current State Map by collecting the data from the shop floor

•To identify the problems faced by the company regarding Non-Value Added time and minimize the waste.

•To propose Future State Value Map which can reduce Production lead time, increase the Value added time and reduce non-value added time.

2. VSM METHODOLOGY

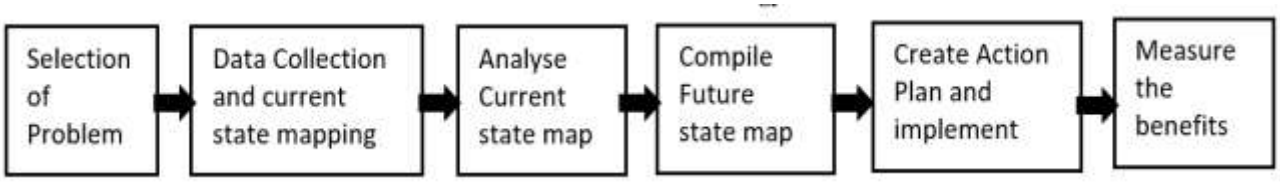

Fig.1. VSM Methodology

i. Identifying product family: To focus on one particular item for improvement.

ii. Drawing current state value map: It includes all VA, NVA, NNVA activities. We can bring CVSM according to past data and customer feedback.

iii. Drawing future state value map: By Continuous analyzing and brainstorming we can draw our targeted VSM.

iv. Work plan: Using lean tools (kanban, supply chain management, poka-yoke, MRP.etc) we have to plan a best promising way to achieve the goal. There are some standard symbols used in VSM drawing for easy understanding.

v. Implementation and Measure benefits: Last step is about the implementing of techniques and measuring benefits achieved from them. [2]

Thus the cycle of VSM will not stop after implementation of FVSM, it will become CVSM for next project, and continuous improvement process will be carried out.t).

3. GENERAL OVERVIEW OF LITERATURE REVIEW

Gokulraju R, Vigneshwar K [3] has suggested to reduce lead time and increase the throughput of a high-pressure gate valve production line through the use of value stream map. By implementing line balancing, 5S and ergonomics the highest performance potential of the manufacturing system can be achieved.Vikram M. Patil, S. G. Bhatwadekar[1] has applied lean tools, various gap areas in the current state were linked in order to prepare future state map. Lean tools such as TAKT Time Calculation, First In First Out, Transportation elimination and Continuous Flow were used for waste reduction.By controlling WIP inventory fewer than 66% and reducing production lead time by 3 days 4.2 hr in the time span of a quarter year, we can say VSM is the effective way to control the inventory and reduce lead time by modifications in the existing manufacturing conditions. Jafri Mohd Rohania, Seyed Mojib Zahraeea [4] by applying some lean manufacturing techniques such as 5S, Kanban method, Kaizen and so on Production Lead-time (PLT) decreased from 8.5 days to 6 days, and the value added time reduced from 68 minutes to 37 minutes. Manjunath M.[5] "In this paper current state and future state is drawn off a manufacturing firm and observed that reduction of 38.2 percent in lead time, process time reduction by 2.65percent, and 48.3 percent reduction in inventory.Cycle time can be reduced from 93minutes to 67 minutes with the help of changing nonlinear workstation to conveyor workstation. It can be seen that the process inventory is reduced from 31 to 16 units. The lead time is reduced from 63.82Hrs to 39.43 Hrs, process time from 16.93Hrs to 16.48Hrs. Anupam Sihag, Vinod Kumar[6] Lean production means continuous improvement, by keep on changing the future state into the current situation will get the better results. In this study process by changing layout inventory time reduced from 3 to 1 days resulting in improvement of 33.33%. Process lead time was reduced by 52.94% and the processing time was reduced by 80.69%.

4. CASE STUDY

An electrical component manufacturing industry selected as a case study in this paper. Since the layout of the factory is base on fix system. As conducted one analysis, we found out that the in-house production components have bottlenecks. Moreover, parts have to be transferred from machine to machine for completion of the operations. This situation causes a decrease in labor productivity and increases material handling cost. Therefore, these causes delay of orders, lower quality, less labor productivity, more waiting times, larger Work in progress (WIP), longer material movement. To these problems, it is necessary to identify the key areas, which are producing wastes, and determining the bottleneck operations in supply chain. The following information is related to production line: The following information is related to production line: working shift per day; coating shop=1, Brazing Shop= 3, Press shop = 3, store= 1.5, cleaning= 1. Daily available time= 480 pcs, working hour per shift= 480min, lunch brake= 40min, other allowances= 20 min, Down time= 0 min.

CSM

Whole information about the present state map was gathered based on the method suggested by Rother and Shook. In the issue of the material flow, data collection began in the distribution section, first cycle times (CTs) of the process, the quantity of employees working, and convert times or change-over time(CO). Figure 1 demonstrated the present position map which was drawn. In this figure, the map's small boxes describe the progression, and the number of the boxes is some workers in every process. Also, every process has a data box under that includes the CT process, the numeral of shifts, machine reliability (MR), and the CO time. All of the processing and installing times are according to the middling of past data. The timeline in the underside of the present situation map is shown in Figure 1 that there are two elements. The first element is about the waiting time of production in days which is gained by adding the number of lead-time from every inventory triangle earlier than every process. Therefore, the time of each inventory triangle is computed by separating the inventory numbers into the everyday customer needs. The totality lead time is approximately 1.02 days. The CT for every process is the average CT that was found out by using real data in the company. From the below data collected, we have identified areas for development to reduce the throughput time of Process. The current state process and related value stream mapping of as shown in Table 1 and Figures 2.

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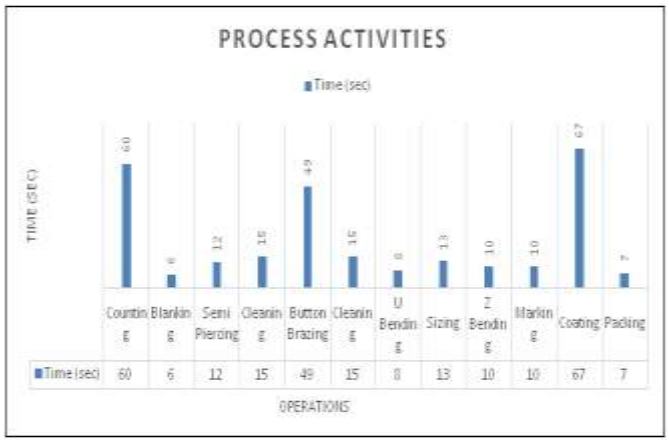

Table 1. Process Activities with Time

Calculations of CSM ratio:

Percentage of NVA Time=Total NVA time in seconds/Total processing time in seconds × 100
=88260/88508 × 100
=99.7194%

Percentage of VA Time=Total VA time in seconds/Total processing time in seconds × 100
=248/88508 × 100
=0.2806%
VSM Ratio=VA / (VA+NVA)
=0.2814 %
Lead Time = VA+NVA
= 1.02 Days

• Lean implementation through kaizen and development of FSM

Kaizen shows a lead role in improving the productivity and quality of the products. Kaizen is a strategy to include concepts, systems, and tools within the bigger picture of leadership involving people and their culture all driven by the customer. The brainstorming analysis of VSM revealed the following major NVA identified as operator's movement and their skill, poor process, delay in material transfer and cooling time for which the proposed lean solutions are suggested as follows. Table 2 and Figures 7 and 8.

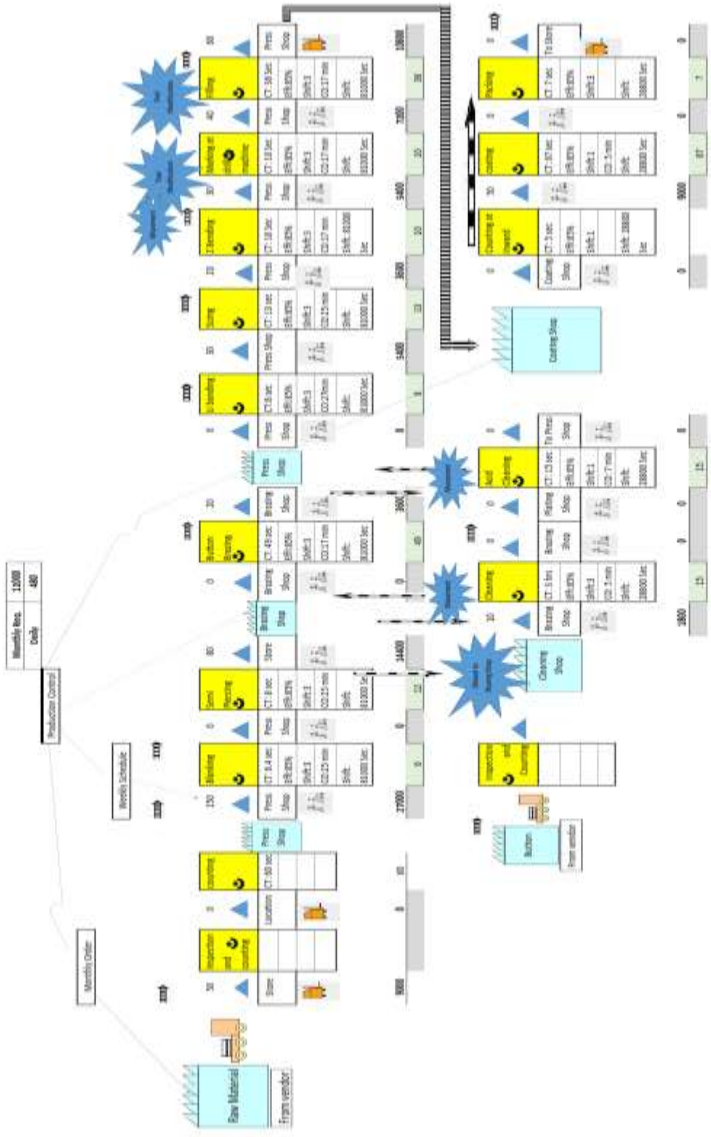

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Table 2. Proposed Solution

Station	Task Involved	NVA Activities	Proposed solution	Expected out come(Time Saving)	Expected out come(Distance saving)	Manpower Saving
Counting	Physical counting of raw material	Counting	Standard Binning	20 sec	0	0
Cleaning	Brazing to Cleaning Shop Long Distance movement	Movement	Cleaning will be done in brazing shop	0	400 m	0
Cleaning	Brazing to Cleaning Shop Long Distance movement	Movement	Cleaning will be done in brazing shop	0	400 m	0
Dot marking	Identity mark	Over Processing	Die modification	10 sec	5 m	1
Sizing	Burr removal due to material variability	Over Processing	Die modification	13 sec	5 m	1

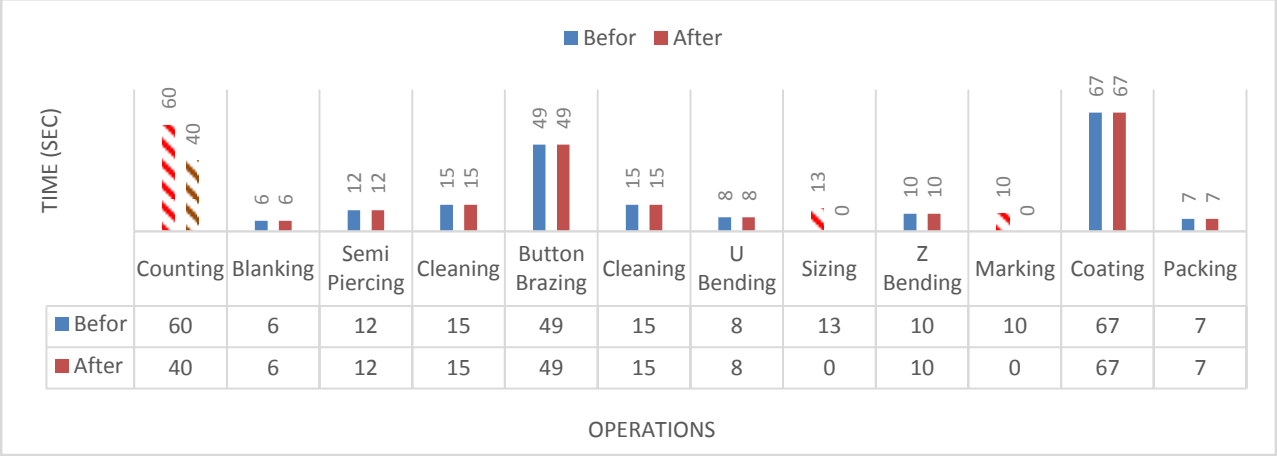

Fig.3Graphical Representation of expected outcomes

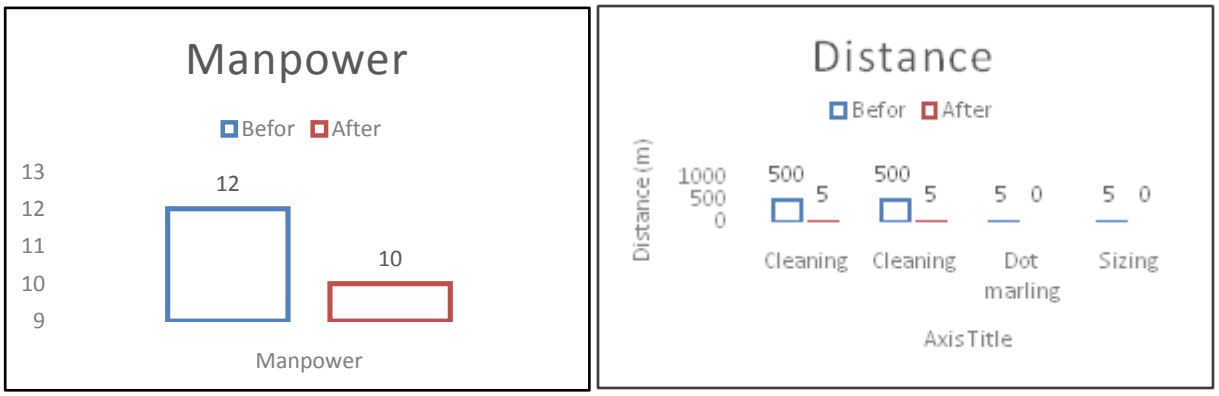

Fig.4 Graphical Representation of Manpower and Distance saving

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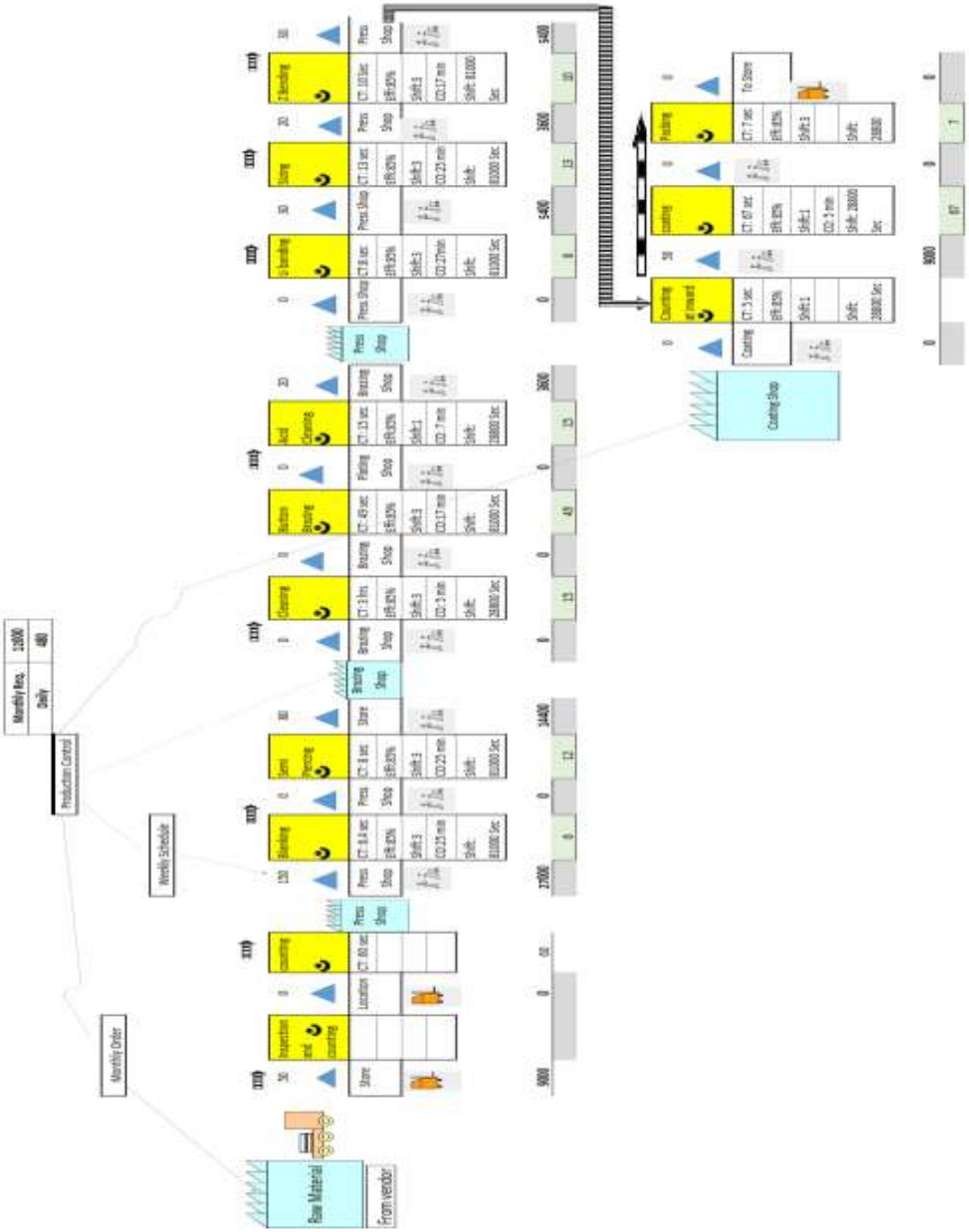

Fig.5 Future State Map

Calculations of FSM ratio:

Percentage of NVA Time=Total NVA time in seconds/Total processing time in seconds × 100

= 68460.0/68662.3 × 100

=99.705%

Percentage of VA Time=Total VA time in seconds/Total processing time in seconds × 100

=202/68662.3 × 100

=0.2947%

VSM Ratio=VA / (VA+NVA)

=0.2956 %

Lead Time = VA+NVA

= 0.79 Days

5. CONCLUSION

By performing the technical suitability, economical justifications and feasibility analysis, we have suggested the recommendations of these tools to induct for the medium scale enterprises confidently. In this study process by changing flow of inventory will reduce in movement from 400m to 5m resulting in improvement of 98.75%. By modification of tool dot marking and sizing i.e. manual

operation will be eliminated and WIP inventory will also reduced. So, by these 2 man power has been removed and 3.5 hours saved. VSM future state map shows significant improvement in the production lead time 1.02 days to 0.79 days, Which demonstrate that any delay can be analysed through value stream mapping.

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