

## Value Stream Mapping: A Case Study of Fastener Industry

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**Abstract:** The A value stream includes all activities required to transform a product from raw material into the finished goods. Value Stream Mapping scrutinizes business processes from beginning to end and a visual representation map is drawn of every process involved in the material and information flows. Then a future state map is drawn to show how things should work for best competitive advantage. Value Stream Mapping helps to identify the current flow of material and information in processes for a family of products, highlighting the opportunities for improvement that will most significantly impact the overall production system.

Nowadays in a competitive market, companies require small lead time, low costs and high customer service levels. As such companies pay more effort to reduce lead time. Value Stream Mapping (VSM) is the one of the lean manufacturing tool. In this study we will utilize value stream mapping (VSM) technique to identify and eliminate different types of wastes in fastener industry. The current state is mapped to capture a snapshot of how things are done and where the improvement potentials lie. Future state map is made to show the implementation action plan considering takt time. A case study carried out in Morning Star Industries Ludhiana, India.

**Keywords:** Value stream mapping, Current state map, Future state map, 5S, Lead Time, Takt Time, Lean tools

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### I. Introduction

Companies are continually striving to increase productivity and output of their operations. 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 various processes. Value stream is aall the steps, both value added and non-value added required taking a product or service from raw material to the customer. Some examples of value added and non value added activities are listed below: Value added activities- forging, rolling etc. Non-value added activities- walking, waiting, inspecting, reworking, unnecessary movement of material 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. From this study we are focusing on SME on factory level or door-to-door VSM.

### II. Methodology

Value Stream Mapping (VSM) is a pencil and paper tool that helps users see and understand the flow of material and information as products make their way through the value stream. VSM has four major steps as given by Rother and Shook is shown in Figure-1.

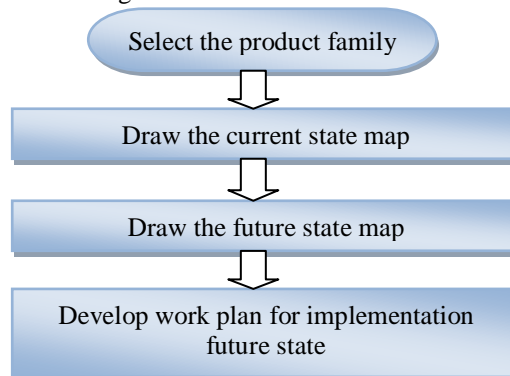


Figure-1 Implementation steps in value stream mapping

In order to draw value stream map following strategies applied:

1. Obtained information from company
2. Conducted time studies
3. Data collected from shop floor observation.
4. E-draw Max version 7.9.4 software is used to draw current and future state VSMs.

### III. Current State Value Stream Map

Demand per month of Hex Bolt is 3500 pieces, effective number of working days are 26 per month, number of shifts per day is 1 and the working hours per shift is 11hrs 10 minutes excluding 30 minutes lunch break and 10 minutes each tea break in morning and evening. Available working time per day in minutes is 670. Takt time comes out to be 297 sec. Current state map in Figure-2 the demand comes from the customers to planning department of MSI Ludhiana, then planning department send its requirement to different suppliers by manually or by electronics media. In present case MSI keeps raw material inventory of 15 days in their store, material moves from raw material store to finished items store through no. of processes like cold forming, rolling, heat treatment, auto black, inspection and packing. Details regarding inventory, avg. cycle time, lead time, up-time, no. of operators and distance travelled by material are shown in Figure-2 against every machine.

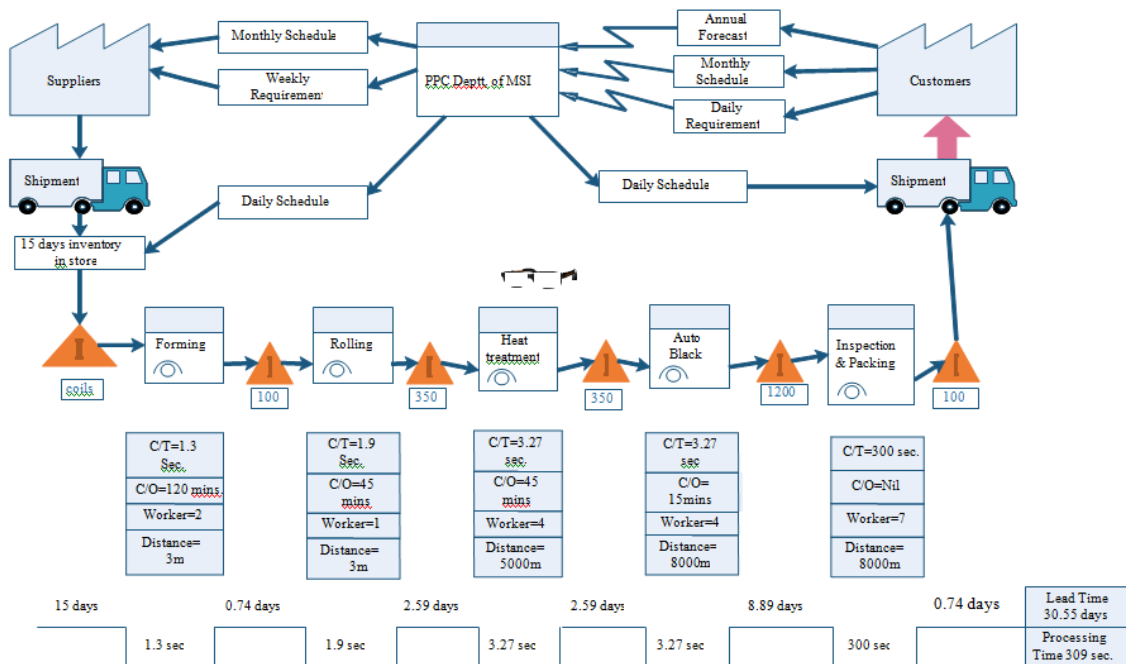


Figure-2 Current state map

### IV. Future State Value Stream Map

Acting upon the gap areas identified by the value stream mapping of the current state, some changes were proposed as indicated in Figure-3. Overproduction is there at forming process. It is suggested that production kanban should flow between forming and rolling. The standard work and 5S system is used at heat treatment and auto black process which are performed outside the company and transportation waste is there. To reduce this material should be moved to heat treatment process shift wise and separate containers are used for different sizes of bolts. And 5S system is also used at inspection and packing section with the help of which the operation time will be reduced and less manpower will be required.

As there is no proper organization of what is stored where, there is no proper space for inspection tools and there is problem regarding material handling. In order to minimize these issues, 5S event needs to be started which is a Japanese concept meaning, a process of creating workplace cleanliness and organization. The 5S stand for Sort (organization), Set in order (Orderliness), Shine (cleanliness), Standardize (standardized clean-up) and Sustain (discipline). This needs to be strictly followed so that the proposed benefits can be achieved

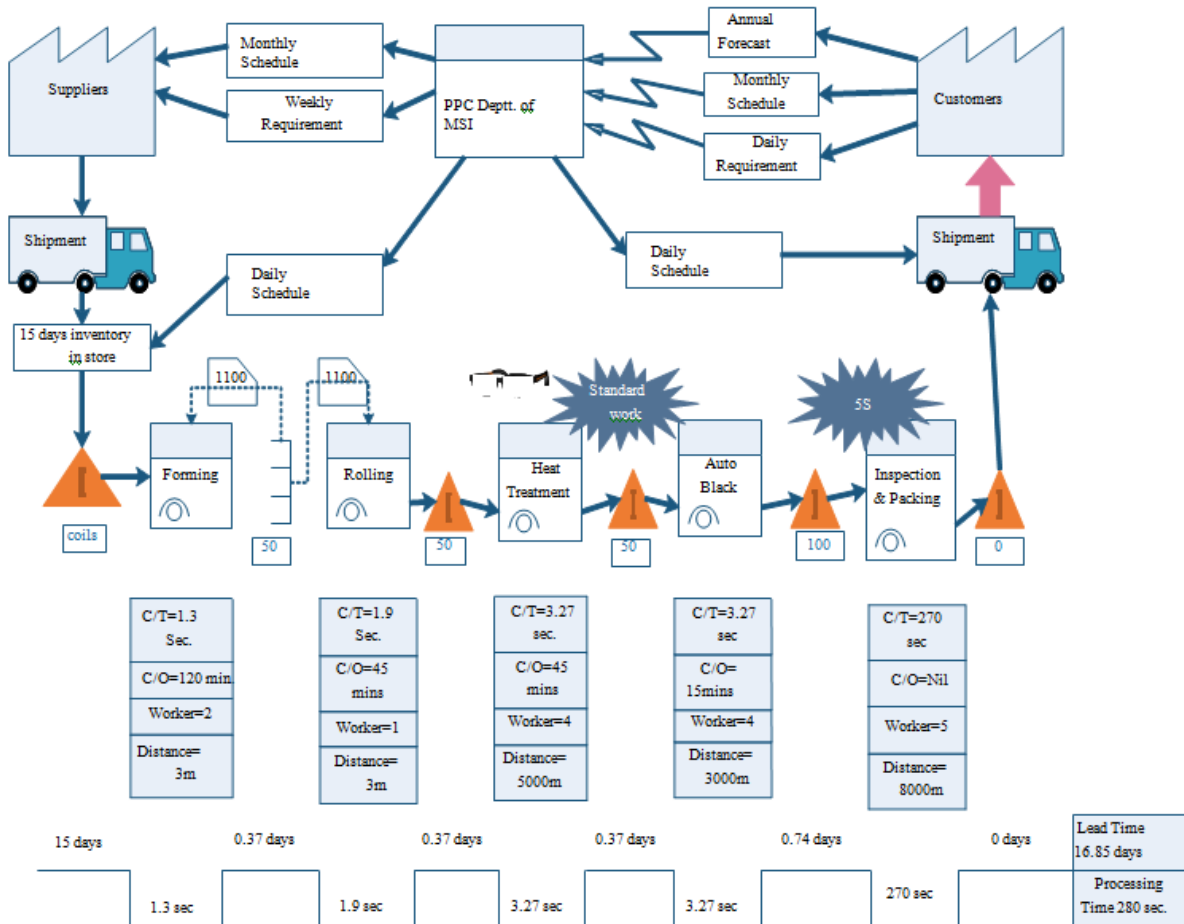


Figure-3 Future state map

### V. Results And Suggestions

The calculations from Figure-3 along with benefits achieved are summarized in Table-1. There are clear indications that work in process inventory is reduced to 250pcs. Production lead time can be reduced to 16.85 days, processing time can be reduced to 280 seconds, operators could be optimum utilized to 16 and distance travelled by material can be reduced to 16006m. All these proposed changes will lead to a significant cost reduction at MSI, and hence it will also help in reducing overall costs in the supply chain. For improvement in these areas there should be TEI regarding the shop floor activities.

Table-1 Comparison of the Current versus Future state

Variables	Units	Current State	Future State
Lead time	Days	30.55	16.85
Cycle Time	seconds	309	280
Inventory	Pieces	2000	250
Operators	Numbers	18	16
Distance	Meters	21006	16006

### VI. Conclusion

It is rightly argue that whenever there is a product for a customer, there is a value stream. This powerful tool not only highlights process inefficiencies, transactional and communication mismatches but also guides about the improvement areas. The following conclusions shown in Table-2 are drawn from this present study:

**Table-2 Percentage reduction in variables**

Variables	Units	% reduction
<b>Lead time</b>	Days	44.84
<b>Cycle Time</b>	seconds	9.38
<b>Inventory</b>	Pieces	87.50
<b>Operators</b>	Numbers	11.11
<b>Distance</b>	Meters	23.80

### References

- [1]. Anand Sasikumar and Kundan Kumar (2013), "Value stream mapping in a manufacturing company", IJCBM ISSN:2319-2828, Vol.2 No.2
- [2]. Ali Turkyilmaz, Ali Gorener, Humeyra Baser (2013), "Value stream mapping: case study in a water heater manufacturer", International Journal of Supply Chain Management, ISSN:2050-7399
- [3]. Aniket B. Pawar, C.A.Waghmare (2014), "Improving productivity by reducing cycle time through value stream mapping in pump manufacturing industry", Proceedings of 7<sup>th</sup> IRF International conference, Pune, ISBN:978-93-84209-09-4
- [4]. B. Vijaya Ramnath, C. Elanchezian, R. Kesvan (2010), "Application of Kanban system for implementing Lean Manufacturing (A case study)", JERS/Vol.I/Issue I/July-sept.2010/138-151
- [5]. G. S. Subashini, S. Mohan Kumar, B. Asaithambi (2012), "Lean manufacturing approach to improve the performance of kitchenware manufacturing industry in Chennai", Internal Journal of Mechanical and Production Engineering Research and Development, ISSN 2249-6890, Vol.2 Issue 3
- [6]. Hines, P. and Rich, N. (1997), "The seven value stream mapping tools", International Journal of Operations and Production Management, volume 17, pp 46-64.
- [7]. Josna Jos Jacob, Jenson Joseph E. (2014), "Reducing the throughput time by value stream mapping in a Tyre Manufacturing Industry", IJERT ISSN:2278-0181, Vol.3 Issue 11
- [8]. Liker, Jeffery K. (2004), "The Toyota Ways-14 Management Principles from the world's greatest manufacturer", Page 27, McGraw Hill, 2004
- [9]. Maxwell Dzanya, Caroline Mukada (2015), "VSM in glide manufacturing: A case study of Insti-Tools in Zimbabwe", IJSTS ISSN:2330-7412
- [10]. Pardeep Dhull, Rajender Kumar, Vinod Dhull, Dimple Khatri (2011), "Reduce the work in progress by using value stream mapping (A lean manufacturing key tool)", International Journal of Mechanical Engineering Application Research, ISSN:2249-6564, Vol.1 Issue 1
- [11]. Palak P. Sheth, Vivek A. Deshpande, Hireen R. Kardani (2014), "Value stream mapping: A case study of Automotive Industry", IJRET eISSN:2319-1163, Vol.3 Issue 01
- [12]. Renu Yadav, Ashish Shastri, Mithlesh Rathore (2012), "Increasing productivity by reducing manufacturing lead time through value stream mapping", International Journal of Mechanical and Industrial Engineering(IJMIE), ISSN No. 2231-6477, vol.1, issue-3
- [13]. Ritesh R. Bhat, Prof. S.Shivakumar (2011), "Improving the productivity using value stream mapping and kanban approach", International Journal of scientific & Engineering Research Vol.2, Issue 8, ISSN 2229-5518
- [14]. Romero D., Chavez Z. (2011), "Use of value mapping tools for manufacturing system redesign", Proceedings of the World congress on Engineering 2011 Vol.1 WCE 2011, July 6-8,2011, London, U.K., ISBN:978-988-18210-6-5
- [15]. Rother, M. & Shook, J. (1999), "Learning to See: Value Stream Mapping to Add Value and Eliminate Muda", Brookline, MA: Lean Enterprise Institute ([www.lean.org](http://www.lean.org)).
- [16]. S.P.Vendan, K.Sakthidhasan (2010), "Reduction of wastages in motor manufacturing industry", Jordan Journal of Mechanical and Industrial Engineering, Vol.4, No.5, ISSN 1995-6665
- [17]. Seth, D. and Gupta V. (2005). "Application of value stream mapping for lean operations and cycle time reduction: An Indian case study", International Journals of Production Planning and Control Vol. 16 No. 1.1 pp 44-59.
- [18]. Soniya Parihar, Sanjay Jain, Dr. Lokesh Bajpai (2012), "Value stream mapping: A case study of assembly process", International Journal of Engineering Research & Technology(IJERT), ISSN: 2278-0181, Vol. 1 Issue 8
- [19]. [www.lean.org](http://www.lean.org) Lean Enterprises Institute, One Cambridge center, Cambridge, MA 02142 USA (617)871-2900, "Shook on VSM misunderstandings".