

# Implementation of value Stream Mapping in Small Scale Industries-A Review

Gaurav Kothari<sup>1</sup>, Dr. Devendra Singh Verma<sup>2</sup>

<sup>1,2</sup>Department of Mechanical Engineering

<sup>1,2</sup> IET, DAVV Indore (M.P.), India

**Abstract-** VSM (Value Stream Mapping) has been introduced into a vast number of companies around the world in present scenario. The practices of VSM (Value Stream Mapping) in manufacturing help companies to continually meet and exceed the needs of their customers in providing high quality products at a low price by adding value to the product. VSM (Value Stream Mapping) is a visual tool by this tool we can see all wastages. So that we can remove these wastages and add the value to the product. In this research there is study of VSM (Value Stream Mapping) and advantages and limitation over the other tools of lean Manufacturing.

**Keywords-** Lean Manufacturing, VSM, TPM, TQM, Poka Yoke, Kan Ban etc.

## I. INTRODUCTION

### A. History

Eiji Toyota and Taiichi Ohno at Toyota Motor Company in Japan pioneered the concept of the 'Toyota Production System', or what is known today in US as "Lean Manufacturing." Lean is a continuous improvement process designed for long term maximization of company resources.[Ohno 1998][1]

Lean Manufacturing is the relentless elimination of waste. Waste is using resource without adding value. Lean manufacturing aims to achieve the same output with less input; such as less time, less space, less human effort, less machinery, less material and less cost [Wolfgang Apel, Jia Yong Li, Vanessa Walton, 2007][2]. Essentially, lean manufacturing seeks to produce a product that is exactly what the customer wants, when the customer wants it, while minimizing all non-value added activities in production [Womack & Jones, 1996][3].

### B. Lean Manufacturing

Lean Manufacturing can be defined as "A systematic approach to identifying and eliminating waste through continuous improvement by flowing the product at the demand of the customer. Lean Manufacturing is all about looking at the time line from the moment the customer gives us an order to the point when we collect the cash. And we are

reducing that time line by removing the non – value added wastes" [Ohno, 1998][1].

### C. Value Stream Mapping

Value stream mapping, a lean manufacturing tool, which originated from the TPS, is known as "material and information flow mapping." This mapping tool uses the techniques of lean manufacturing to analyze and evaluate certain work processes in a manufacturing operation. This tool is used primarily to identify, demonstrate and decrease waste, as well as create flow in the manufacturing process. VSMs can be created merely using paper and pencil; however more advanced maps are created using Microsoft Visio as well as Microsoft Excel. Value stream mapping, a lean manufacturing tool, used to visualize where the waste is present in the whole stream from the supplier's raw material delivery until it sees its way through till delivering to the end customer. It is a collection of all activities both value added and non value added that are performed to produce a product. It is also a tool used to identify which lean technique has to be used to cut down the waste and be more productive [Seth and Gupta, 2005][4]. VSM ties together the all lean concepts and techniques thereby more useful than quantitative tools. Also, it gives coordination between the material and information related to the entire process thereby also known as 'Material and information Flow Map'.

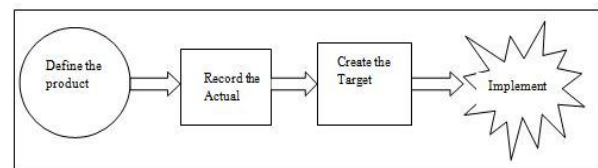


Figure 1: Line diagram of VSM

## II. OBJECTIVE OF RESEARCH

This research paper is based on secondary data, secondary data is collected from various article and magazines and research articles available on internet. The key research objectives of research papers are –

1. To identify various advantages to implement VSM (Value Stream Mapping) in industry.

2. To identify further the practices in VSM.
3. How does a firm's orientation about VSM affect quality practices?
- d. Waiting Over-Processing
- e. Overproduction
- f. Defects

### III. LITERATURE REVIEW

Abdulmalek FA,Rajgopal J[4] has Explored the integration of VSM with simulation .A VSM software(eg. eVSM) presents the user with dynamic view of value stream allowing observation of the “real time” impact of proposed improvements, using ARENA software.

Wolfgang Apel,Jia Yong Li,Vanessa Walton[2] is Suggests Inventory time as the biggest part of the current lead time. Inventory levels directly affects the Lead time so more WIP longer lead time. So VSM is Effective way to analyze a company's current production state and point out problem areas.

M. Rother, J.Shook[5] tells us that among the entire tools & techniques of Lean to Improve the waste in industry, VSM is one of lean tool which unveils all kind of waste and it is the only tool which link the information flow and material flow.

Zheng LI,Xiao Jing, Hou F, Feng Wei, Li Na (2008)[6] tells us that Value stream mapping has proven to be an effective way to analyze a company's current production state and point out problem areas.The visual nature of Value Stream Mapping, by combining information and material flow on one map, depicts how the two relate to the lead time.

Mariagrazia Dotoli, Maria Pia Fanti, Giorgio Lacobellis[7] tells us Waste reduction in discrete manufacturing system by internal logistic improvement .

### IV. APPLICABILITY OF TOOL ACCORDING TO TYPE OF WASTE

#### D. TYPES OF WASTES

According to the Toyota Production System (TPS) ,there are seven original wastes known as “muda” which means “waste” in Japanese. In order to create a lean working environment, these wastes need to be identified and depleted [Womack et al. 1990][5].

The Seven Wastes of Lean Manufacturing are;

- a. Transportation
- b. Inventory
- c. Motion

These wastes can be eliminated by Lean tools

- a. JIT
- b. VSM
- c. TPM
- d. TQM
- e. KANBAN
- f. KAIZEN
- g. POKA YOKE
- h. 5S

Table 1: Types of waste and methods for their relationship

Type of waste	Tools for elimination
Waiting	Value Stream Mapping
	Total Productive Maintenance (TPM)
	Improved Supplier customer Relationship
	Work according to Takt time
	Just In Time
Transportation	Value Stream Mapping
	Green Technology
	One Piece Flow (Work Stream )
Unnecessary Movement	Value Stream Mapping
	5S
	One Piece Flow (Work Stream )
Inadequate Processes	Value Stream Mapping
	5S
Inventory	Value Stream Mapping
	One Piece Flow (Work Stream )
Overproduction	Value Stream Mapping
	5S
	One Piece Flow (Work Stream )
Defects	Value Stream Mapping
	Tools for Quality Control
	POKA YOKE

## V. CONCLUSION

It is clear by the reviews of papers and comparison table that VSM is best and universal tool to eliminate all types of waste. Value stream mapping has proven to be an effective way to analyze a company's current production state and point out problem areas. The visual nature of value stream mapping, by combining information and material flow on one map, depicts how the two relate to the Lead time.

### A. FUTURE SCOPE

1. Lean Manufacturing concept can be implemented in units other than automobile industries, electronics industries and process industries.
2. Further Implementation of mathematical modeling would be beneficial to count the work force flexibility.
3. Application if VSM simulation software can be the area of future studies so as to provide authentication to the outcomes and search out for the possibilities by altering variables.

4. Application of various line balancing techniques and other industrial techniques like job scheduling can be the future research in area of manufacturing.

## REFERENCES

- [1] Ohno, Taiichi (March 1998), Toyota Production System: Beyond Large-Scale Production, Productivity Press, ISBN 978-0-915299-14-0
- [2] Wolfgang Apel, JiaYong Li, Vanessa Walton, "Value Stream Mapping for Lean Manufacturing Implementation", Worcester: Project Report submitted to the Faculty of Worcester polytechnic institute (wpi) and central industrial supply (CIS), 2007
- [3] Womack, J.P., Jones, D.T.,(1996); Lean Thinking-Vanish Waste and Create Wealth in our Corporation. New York: Simon & Schuster.
- [4] Abdulmalek, F. A. and Rajgopal, J. (2007); "Analyzing

- the Benefits of Lean Manufacturing and Value Stream Mapping via Simulation: A Process Sector Case Study,” *International Journal of Production Economics*, Vol. 107, No. 1, pp. 223-236.
- [5] Rother, M., Shook, J., (1999). *Learning to See: Value Stream Mapping to Add Value and Eliminate Muda*. The Lean Enterprise Institute, Inc., Brookline, MA 1999.
- [6] Zheng Li., Xiao Jing., Hou F., Feng Wei., Li Na (2008) Cycle time reduction in assembly and test manufacturing factories: A KPI driven methodology. *Industrial Engineering and Engineering Management*, 2008. IEEM 2008. IEEE International Conference: 1234–1238 doi: 10.1109/IEEM.2008.4738067
- [7] Mariagrazia Dotoli., Maria Pia Fanti., Giorgio Lacobellis, A Lean Manufacturing Strategy using Value Stream Mapping And Discrete Event Simulation 8th IEEE International Conference on Automation Science And Engg.
- [8] 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*, 2005 ; Vol.13, Issue 3, pp 58-68.
- [9] Womack, J.P., Jones, D.T., Ross, D., 1990, *The Machine that Changed the World*. Macmillan Publishing Company, Canada
- [10] Mark Nash, Sheila R. Poling(2006), “Using Lean for Faster Six Sigma Results: A Synchronized Approach”2006.
- [11] Baudin, M. (2002). *Lean Assembly: The Nuts and Bolts of Making Assembly Operations Flow*. New York: Productivity Press.
- [12] Feld, W.M., 2000. *Lean Manufacturing: Tools, Techniques, and How To Use Them*. The St. Lucie Press, London. Law, A.M., Kelton, W.D., 1991. *Simulation Modeling and Analysis*, second ed. McGraw-Hill, New York.
- [13] Hines, P. and Rich, N.(1997), “The seven value stream mapping tools”, *International Journal of Operations & Production Management*, Vol. 17 No. 1, 1997, pp. 46-6