Implementation of a Lean Model in Manufacturing Industry

G.Rajesh
Assistant Professor, Department of Instrumentation Engineering,
PSG Engineering and Technology, Coimbatore

Abstract

Value Stream Mapping technique involves flowcharting the steps, behavior, material flows, interactions and other process elements that are involved with a procedure or transformation. With respect to Value stream mapping helps an association to recognize the non-value-adding elements in a targeted process and brings an invention or a group of products that use the same resources throughout the main flows, from raw material to the arms of customers. In this study, a practical study carried out in a manufacturing industry for the manufacture of Machining center is discussed. The major aim was to draw the modern state value stream mapping for the main Components like Base, Column, Cross Slide, Milling Head and Table. Additional the paper has identified some of the processes which can be approved out by the sub service provider and recommended measures to be taken up by the higher level management in reducing the non value added process. It discusses the reduction in the set up time and cycle time that can be obtained during the implementation. This paper also discusses the plan of action for humanizing the Future State Value Stream Mapping (FVSM). A FVSM for the manufacture of Base is drawn.

Keywords: Current state value stream mapping (CVSM), Future state value stream mapping (FVSM).

I. INTRODUCTION

The research study was conceded out in a CNC manufacturing unit placed in Bangalore, which manufactures cylinder heads, cylinder blocks, crank case crank shaft, concerning rod etc, to the Automobile, Textile, Defense, Agricultural, Railway and Electrical sectors. They are also the manufacturers of Special Purpose Machines. The study discusses the accomplishment of Value Stream Mapping accepted out in the CNC machining center division of the industry. The most important aim was to reduce the cycle time and to eradicate unnecessary facilities and suggest enhancement measures from the lean manufacturing perspective. Consequently the research work focuses on mapping the current state, reducing the cycle time and the setup time and suggests a future state value stream mapping for the manufacture of a machining center. The objectives for the implementation of the lean manufacturing tools in this industry are,

• To study the Current State Value Stream Mapping by collecting the preliminary data.

• To identify the problems faced by the Industry in terms of Non Value Added time

• To offer the Future State Value Stream Mapping which can raise the Value added time and reduce non value added time.

II. LITERATURE SURVEY

Taiichi Ohno (1988), Womack et al (1990), Womack and Jones (1998, 2005), Daniel. T. Jones (2006), Rother and Shook (1999), and Peter Hines and Nick Rich (1997) have studied the accomplishment of Value Stream Mapping efficiently. In concentrate, Value Stream Mapping (VSM) is a visualization tool leaning to the Toyota version of Lean Manufacturing. It helps to comprehend and rationalize work processes using the tools and techniques of Lean Manufacturing. The goal of VSM is to recognize, demonstrate and decrease waste in the process. Waste being any activity that does not add value to the ending product, often used to display and decrease the amount of waste in a manufacturing system.

VSM can thus serve as a preliminary point to help administration, engineers, production associates, schedulers, suppliers, and customers distinguish waste and categorize its causes. As a result, Value Stream Mapping is primarily a communication tool, but is also used as a strategic planning tool, and a change management tool. Toyota have been benefiting since 1940's, from Material and Information Flow Mapping or Value stream mapping. Taiichi Ohno (1988) could not see waste at a glance that is especially across a geographical area. He developed Material and Information Flow Mapping (VSM) as a normal method for mapping the flows visually and it became the standard basis for scheming improvements at Toyota as a common language. It became one of their business planning tools. VSM is now utilized all over the world, in many businesses to purposefully plan and it is the

starting point to any lean transformation and implementation. Womack and Jones (1998) and Moore (2006) have stated that, the organizations of many types are implementing lean manufacturing, or lean production, practices to respond to aggressive challenges. They have mentioned that lean initiatives can be taken up in the fields of automotive sector, aerospace, and consumer goods industry around the world.

Moore has discussed a variety of implementation tools of Lean Manufacturing, which can be integrated in the industries. Rother and Shook (1999) have discussed that Value Stream Mapping is used to define and evaluate the existing state for a product value stream and design a future state listening carefully on reducing waste, improving lead-time, and improving workflow. The use of VSM appears to be increasing, mostly since the publication of learning to see by Rother and Shook. One of the unique distinctiveness of VSM in comparison with other process analysis techniques is that one map depicts both substance and information flow that controls the material flow. The spotlight of VSM is on a product value stream for a given creation family products that follow the same overall production steps. Doolen et al (2002) have comprehensive the applications of lean production techniques in the electronics industrialized perspectives. Hyer (2002) has implemented Lean manufacturing in the office service and organizational processes. Badrinarayana and Sharma (2007) discusses that the mutually dependent components form the value stream and Value Stream is the set of all specific actions required to bring out a specific product. In order to attain noteworthy improvements the Zayko, et.al (1997) have decided to use value stream mapping to visualize the entire flow and select lean tools that yielded maximum benefits.

Hines and Rich (1997) have opined that the value stream is the detailed activities within a supply chain necessary to design order and make available a specific product or value. Simchi-Levi et al (2004) are of the estimation that the customers are always disturbed with their order status and sometimes they value the order status more than a reduced lead time. But, McDonald et.al (2002) point out that the VSM create a common language for production process thus is facilitating more thoughtful decision to improve the value stream. This will effectively reduce the wastes and improves the production. While researchers and practitioners have developed a number of tools to explore personality firms and supply chains most of these tools fall short in concerning and visualize the nature of the material and in sequence flow in an individual company. McDonald et.al (2002) have used simulation techniques for the high arrangement motion control products industrialized system to reveal that, simulation can be a very crucial tool in assessing dissimilar future state maps. They exhibit that simulation can provide and examine diverse scenarios to complement those obtained from future state mapping. The value stream mapping was extended in the field of aircraft manufacturing also. Abbett and Payne (1999) have discussed the application of value stream mapping in an aircraft manufacturing unit. They have developed the current and future state maps with the objective of reducing lead time according to customer's requirements.

New (1993) and Jones et.al (1997) and other researchers urbanized personality tools to understand the value stream. VSM extends supervision for improvements in the process, identifies the call for to get better workflow and finally shows avenues to diminish waste. Shingo (1989) has discussed the strategies for the efficient implementation of Value Stream Mapping in a wood industry. He also opines that loops can be created to distinguish the similar processes and these loops will be accommodating in identifying the non value activities in a systematic manner. He has recommended the ways to eliminate non value added activity and proposed measures to increase the Value added ratio. Yang-Hua and Valandeghem (2002) describe, Value stream mapping as a mapping tool that is used to illustrate supply chain networks. It maps not only material flows but also information flows that signal and control the material flows. The material flow path of the product is traced back from the final operation in its routing to the storage location for raw material. This visual representation facilitates the process of lean implementation by helping to identify the value-added steps in a value stream, and eliminating the non-value added steps or waste. Often, key questions in exploratory these types of processes are to be supposed to the current plans of industrialized should remain internal or has to be outsourced. All these discussions have prompted the authors to carry out VSM as a useful tool to explore additional redesign opportunities, set targets and to propose for the future performance levels. This prompted the authors to study the processes of manufacture of machining centers and have drawn CVSM for all the processes (I objective) and carried out brain storming sessions with the managers and engineers concerned to arrive at FVSM and have suggested action plans to be taken to effectively implement FVSM.

III. IMPLEMENTATION

A model plan was inwards at after the exhaustive discussions with the management. As the industry was industrialized many products, it was anticipated to carry out a case study in the CNC

perpendicular machining center division. A representation for transport out Value stream mapping in this industry was devised. The model proposed for the implementation of VSM is shown in the Figure 1. The model proposed is appropriate for any Medium Scale Industries in India. The plan starts with problem announcement and discusses the issues relating to the commitment from the management. An exhaustive Plan is discussed herewith for the implementation in the phased manner. However, the paper discusses the issues relating to CVSM and FVSM for the manufacture of machining center.

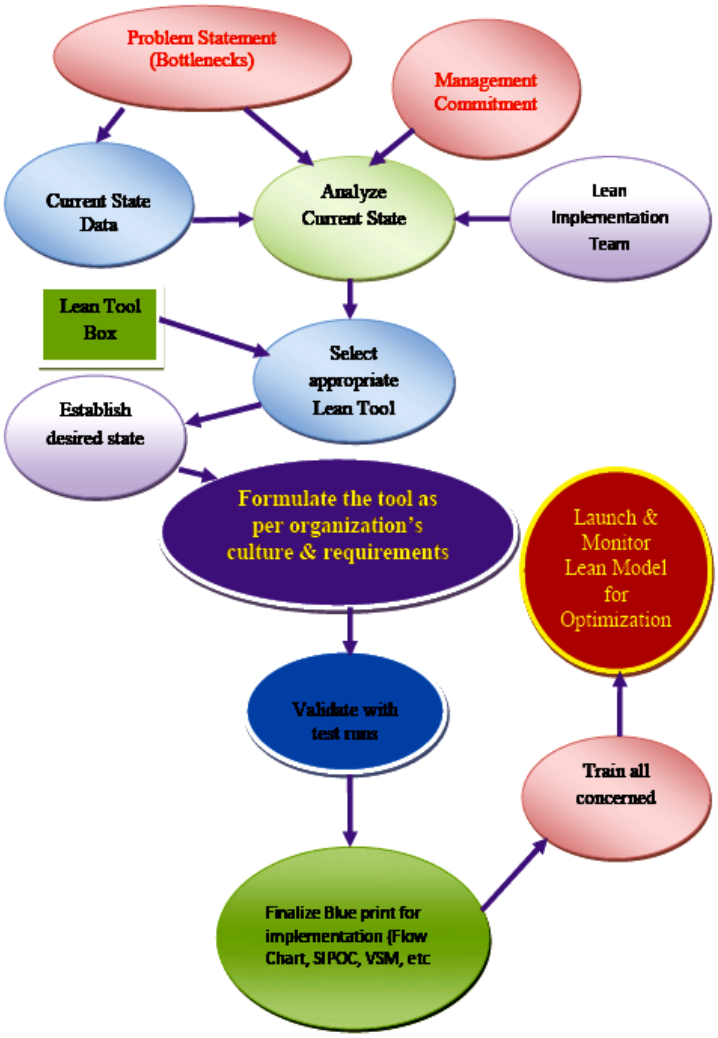

Fig 1. Implementation Model for the Value Stream Mapping

The model parameters to be considered during the implementation are,

Problem Statement - The major aim is to categorize the problems prevailing and to fill the gap in order to establish lean compliancy.

Management Commitment - This is a significant step for lean implementation inventiveness. The organization has not only to be committed but also should be willing to implement change.

Current State Data collection - This is an imperative step in VSM analysis. The data is composed while walking along the actual pathways of substance and information flow. The data collection begins at the distribution end and work towards the upstream. Data has to be composed using the stopwatch and should individually collect the data of cycle time and change over time for the process of manufacture. Hence, as per the requirements, the appropriate data has to be collected. The investigation of the current data collection is based on the bottle necks observed in the process of Manufacture.

Lean Implementation teams – The group supposed to have managers, engineers and workers, who are multi skilled, should be complete to accept the changes which the proposals advise. This plays a significant step in the lean tool implementation. A survey with interviews has to be carried out.

Lean Tool Box- A complete knowledge on the implementation and the use of Lean Manufacturing tools like Kanban, Value Stream Mapping, One piece flow, Pareto diagram, Cause & effect Diagrams, Why-Why analysis, PQ analysis, Total Productive Maintenance, Total Quality Management etc are necessary. Conversely, in this case, an attempt has to be made in mapping the Current and future Value Stream Mapping.

Select appropriate Lean Tool- Once the data is composed, depending on the problems and the gaps established in the industrialized activity, an appropriate lean tool need to be applied. This is based on the customer's requirements in the downstream.

Establish desired state –The preferred state is based on the objectives set by the management.

Formulate the tool as per the organization's culture & requirements - This is the majority critical step for efficient implementation in any intermediate scale industry from the Indian context. The medium scale Industries in India as a policy confirmed by Government of India are proposed for high donation to domestic manufacture, important export earnings, low speculation requirements, operational flexibility, location wise mobility, low intensive imports, capacities to develop appropriate indigenous technology, import substitution, involvement towards defense production, competitiveness in domestic and export markets. But, the limitations the medium scale

Industries face are low Capital base, concentration of functions in one or two persons, inadequate exposure to global environment, inability to face impact of World Trade Organization (WTO) regime, insufficient involvement towards R & D and lack of professionalism. Further, these companies face problems of cultural factors in their implementation initiatives as many intermediate scale industries are launched in regional belts with cultural barriers. Further, the training initiatives form one of the core need areas in the implementation.

Validate with test runs – The representation has to be validated by carrying out test runs before initiation the proposal on a full scale.

Finalize blue print for the implementation – Use flow chart, Supplier-Input-Process-Output-Customer (SIPOC) system of accomplishment, Value Stream Mapping etc. In this study, the research scholar has planned to propose a future state value stream mapping.

Train all the employees or employers concerned with the implementation plan- This is the most crucial step, as the recruits should cultivate the lean thinking. It is projected to the administration to carry out training program for the effective implementation.

Launch & Monitor- This is the final step in the work.

IV. CONCLUSIONS

It was experimental that, due to massive potential in the lean manufacturing tools, value stream mapping study was agreed out of the medium scale industry for the manufacture of machining center. It was practical from CVSM that the value added time was less. Therefore, the study was carried out in the manufacture of Base, Column, Cross Slide, Milling Head and Table and various parameters like cycle time, set up time, WIP were recorded. By carrying out interviews with the managers, engineers and workers, the authors have planned measures to reduce cycle time and improve the process of manufacture. A CVSM was drawn for all the processes as it was one of the main objectives of this study and documented the reasons for increase in cycle & set up time. The authors have optional FVSM for improving the value added time by reducing the cycle time and the set up time. To conclude, the reductions in the cycle time after the implementation is estimated and proposed.

REFERENCES

[1] Abbett D., Payne V. (1999), Gulfstream value stream tour; presentation at 1999 Lean Summit.

[2] Badrinarayana S., Vishnupriya Sharma. (2007), Value stream mapping as the systems way of optimizing the flow in an organization for producing of goods, Proc in a Challenge for Collaborative Manufacture systems; APCOMS 2007; Bali, 5th -6th Sept.

[3] Doolen T., Nagarajan R.D, Hacker M.E. (2002), Lean manufacturing: An electronics manufacturing perspective; Proc. of the 2002 IERC; Orlando, FL, May 19-22.

[4] Hines P., Rich N. (1997), The seven value stream mapping tools; International Journal of Operations & Production Management 17(1); 46-64.

[5] Hyer N.L., Wemmerlov U. (2002), The office that lean built; IIE Solutions 34; 37-43.

[6] Jones D. T. (2006), From lean production to lean consumption- Chairman; Lean Enterprise Academy, UK, www.leanuk.org.

[7] Jones D.T., Hines P., Rich N. (1997), Lean logistics; International Journal of Physical distribution & logistics Management 27(3/4); 153-173.

[8] Simchi-Levi D., Kaminsky P., Simchi-Levi E. (2004), Designing and managing the supply chain, concepts strategies and case studies; McGraw-Hill.

[9] Yang-hua, L., Vanlandeghem H. (2002), An application of simulation and value stream mapping in lean manufacturing; Proceedings 2002; October 23-26, Dresden, Germany; 300-307.

[10] Zayko M., Broughman D., Hancock W. (1997), Lean manufacturing yields world class improvements for small manufacturer; IIE Solutions 29(4); 46-64.