A Review on Value Stream Mapping to reduce the Cycle Time of Butterfly Valve

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ABSTRACT

To stay in Globalize world, industries essential to reduce the cycle time and costs in order to improve operating performance and flexibility. Now days' company tries to reduction of total lead time and cycle in manufacturing company through lean philosophy. This paper include basic summary of the literature review for the purpose of research on the investigation of use of value stream mapping to enhance productivity by reducing cycle time. The main purpose of this work is to show the use of VSM methodology which were used in assembly of butterfly valve to increase productivity. Value Stream Mapping is a basic and mostly used lean tool to identify and overcome of waste and it cause. VSM is language of lean manager. The review shows that the VSM tool is assure to reduce waste, enhance the productivity and cycle time reduction. Value stream mapping is differ in terms of it able to collect information of individual process, cycle time, up time, available time, change over time, WIP inventory, and manpower requirement.

Keywords : VSM, Improve Productivity, Cycle Time Reduction, Reduce Waste

I. INTRODUCTION

This manuscript illustrates a case study based on cycle time reduction of butterfly valve process. The process includes heating Disc/stem unit in oven, Shell assembly, hydro test, automation assembly, functional test. Overall cycle time is 92Minutes and we remove NVA activity from process to reduce cycle time. Productivity generally state the relationship between the quantity of goods and services produced and the quantity of capital, land, energy, labor and other resources to produce it. Lean manufacturing is techniques which aim is to considerably reduce all waste in the manufacturing processes. Lean manufacturing has an ability to produce product using the least amount of non-value-adding activities that add time and then cost to the manufacturing process. The methodology provides an objective to set of tools for designing manufacturing processes with minimum waste like wait, move and queue time normally embedded in launched and routed shop order based systems, in split of products manufactured. Value stream mapping is a lean tool to identify the value added and non-added activity. It is actually visual representation of material flow and information flow in value stream. In Value stream mapping creates a two maps starting with current state map it gives the current flow of information and material and second one is create a future state map for remove identify waste in current state map and improve the process.

II. LITERATURE REVIEW

Rahani [1] study on Lean Production principles was adapted in the manufacturing sector of an automotive part manufacturing plant. Value stream mapping is use to find opportunity of implementation various lean tool in process. They first drew Current State

Map to analysis of what real thing on the production floor. After that Future State Map is design based on current state map for a new lean process flow. The purpose of this study is improving product a disc, D45T through the elimination of the root causes of waste and through process improvements. The use of the VSM improved the approach in Lean production initiatives as it reveals obvious and hidden waste that affected the productivity of D45T production. The VSM was applied to measurable require impact of a change in the production process resulted in lower rejection rates, reduction in rework, lead time reduction.

Seyed Mojib Zahraee et al. [2] Conducted study on value stream mapping to analysis of current production flow in industry. In this study they identify Waste and cause of waste by visual mapping of current state and by use of proper product selection, conceptual design, and time frame formulation, team formation required benefits are gain. From VSM they find where use the lean techniques like 5S, visual Management and SMED technique to improve process and reduce waste. Finally after lean implementation they achieve to reduce value aided time 37 minutes from 68 minutes. They also achieve reduction in total lead time from 8.5 days to 6 days.

K. Venkataraman et al. [3] study in crank shaft manufacturing industry. They want to cycle time reduction of crank shaft by value stream mapping. They use various types of lean tools to attain more benefits. For this first they create a current state map of the manufacturing of crank shaft assembly and observe needless activity. Second creates a future state map for improving current process by implement lean tools to reduce waste in crank shaft assembly line and improve current value stream of process. For take good decision they use analytical hierarchical method than achieve beneficial result. From value stream mapping they able to get the one piece flow, reduce

the inventory, and able to respond customer demand quickly.
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Sudipta Chowdhury [4] investigated on how to improve productivity of furniture manufacturing. They implement various lean tools such as Single-Minute Exchange of Dies, 5S, Gemba and kaizen. After implementation of lean tool they gain improvement in cycle time reduction and cost saving. And about 2.26 increase overall equipment effectiveness after lean implementation.

Amir azizi et al. [5] conducted this study based on design an efficient Value Stream Mapping to improve the productivity in Small and Medium Enterprise by eliminating non-value added activities. The methodology of VSM they take, first analyze the overall production waste in current state map, and secondly use the different Kaizen activity with lean tool Single Minute Exchange of Die to effectively make and support future state for current process improvement. This paper concludes that Future Value Stream Map helps to effectively identify wasteful activities and production processes. VSM and Kaizen are input for continuous improvement by reducing the lead time of manufacturing using SMED. Improvement process is use to reduce the WIP inventory and product lead time using SMED and Kaizen techniques. The machine setup time in the insertion process was reduced from 145 seconds to 54 seconds by use of SMED.

Monir Hossain [6] was study carried out in a Bread production line in Bakery. The aim of this study was to reduce the long lead time of the current Bread production process. They use some lean tools like Value Stream Map, Pareto Analysis and Process Cycle Efficiency to reduce the long lead time. At current state the lead time was 32605 sec, PCE 12.82% and Takt time 19.94 sec/bread (200g) were observed and after the implementation of lean tools at future state

map they reduce lead time 8742 sec, PCE 29.98% and Takt time 10.69 sec/ bread (200g).

Rumbidzayi Muvunzi et al. [7] conducted study in the tiles manufacturing industry. Aim of their study was improve productivity by value stream mapping. They study on value stream mapping to improve productivity. They increase productivity 20,200 tiles per month to 28,340 tiles per month. There was save cost up to $4419 by decrease defective tile from 245 to 10 per month. By reduction of rework there was save raw material which contribute around 168 tiles per day. Lead time improve from 8467 seconds to 5657 seconds, which contribute around 12% of production time.

Soniya Parihar et al. [8] study on value stream mapping. The aim of this research was identify and rectify non value added steps from processing. In this research work they do detailed analysis and methodology of VSM.by use of VSM it is possible to find current flow of material and information and find improvement opportunity in process.in this study they addresses different VSM symbols. Use Primary data collecting methods to collect data like takt time, cycle time, changeover time, available time, up time. After proper study of VSM they reduce lead time from 4.30 days to 3.50 days and cycle efficiency increased 0.476% from 0.388%.

Rahul.R.Joshi, G.R.Naik [9] study on VSM in Die manufacturing company. The aim of their work is shorten the cycle time by removing waste. From current state map they visualized current production flow and from this identify all waste which affect the cycle time and it root cause identify and Future state map is developed based on current state map. They use lean tools like kanban, visual management, S.O.P. VSM is basically strategic planning tool. From VSM and other lean tools cycle time is reduce up to 9600 minutes from 14400 minutes.

Sriraam S.V et al. [10] focuses on reduction of lead time in electrode manufacturing company by implementation lean techniques.by VSM concept area of opportunity to modification of plant layout is possible and overall reduction in lead time was 1880minutes from 2160 minutes thus total 280minutes was save. The production of electrode per year is increased about 19000.

Antonio Pedro Lacerda et al.[11] study on effective use of value stream mapping in automotive industry.at beginning first they collect pertinent data of actual process and map current process and analyzed it. They suggested fourteen solutions to elimination of waste. From future state map represent stabilization of process. As a result, cycle time was reduced from 370 seconds to 140 seconds, reduction of one operator and achieves 25% reduction in WIP inventory

Bhim singh et al. [12] presents a benefit to industry by use of value stream mapping. VSM contain both value added and non-value added activities. This paper covers literature of VSM. This paper classifies VSM in different application as for modeling work, conceptual work, case study, survey article. From analysis of current and future VSM they able to reduce inventory level 1030 from 6053, reduction in WIP is 653 to 130, total lead time is reduce from 280.99 to 47.64h, reduction in changeover time is 711 to 663 s.

Santosh B. Dighe, Abhay Kakirde [13] work on develop VSM in pump assembly process. Industry wants to create lean environment in industry. To successful implementation of lean it is required to develop VSM for remove waste. VSM is base to find waste and their causes in process and remove it by some lean tools. Company mainly suffering from WIP and inventory so aim of this work is to reduce WIP or inventory in firm by implementing pull system.by develop of VSM they reduce lead time 36.5 days and 22.4 days of inventory.

Manjunath M. et al. [14] describe how VSM is efficient tool to implement lean manufacturing and suggest improvement area. VSM is continuously support to firm to move toward lean enterprise. The main aim of lean is improve quality, cost minimize, improve productivity. They are compare both current and future state of VSM and observe benefits which are reduction in lead time around 38.2%,overall cycle time reduction about 2.65%,inventory level reduce 48.3%.

Aravinth Kumar et al. [3] study on how to reduce lead time in pump manufacturing industry. The primary data is collected by survey of past data. VSM is used to map current and Future state to find hidden waste in existing process. They used I-GRAFX software to make VSM. By VSM they find area of improvement and remove waste from process. In press shop work in process inventory has been reduced 2.4 days from 7.4 days. OEE has been improved from 60.4% to 78.64%.After final VSM it can be observed that total reduction in lead time was 33.85%. WIP reduced from 24.4 to 16.14 days.by line balancing the requirement of operator is reduced from 7 to 3.Productivity of pump is improved 7.7% and one piece flow could be achieved.

III. CONCLUSION

After studying all research paper, we found that the effectiveness of VSM in lean production. VSM is base for implement lean tools in any organization. VSM basically find non value added activity or waste and find area of opportunity to improvement by removing waste.by use of VSM it is possible to get improve productivity, improve process, reduction in cycle time and lead time.

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