

# Implimenting the VSM Technique in Textile Industry for the Better WIP

Dr. Dushyanth Kumar K.R

*Assistant Professor, Department of Mechanical Engineering, Malnad College of Engineering, Hassan-573201, Karnataka, India*

**Abstract - Economy for the any organization is based on the factors like product cost, production time, Total quality management and waste reduction in the production processes makes an impact. Next to the agriculture textile industries are playing great role in the GDP role of the country.**

The textile industries are facing problems like long cycle time, WIP inventory, and also inflexible in process factors of machineries these are called Non Value Added (NVA) activities in the production processes. To avoid these factors the use of advanced manufacturing techniques like Lean Manufacturing, agile manufacturing, world class manufacturing systems plays a very big role in the current industrial scenario. In this research work, the implementation of the Value Stream Mapping technique and layout modification is used. Through this technique the whole production time and also WIP inventory is reduced drastically reduced and reduction of total time also possible to get the real productivity is the main motive of this work

**Keywords- Lean Manufacturing, layout modification, Value Stream mapping, Garment process improvement.**

## I. INTRODUCTION

While considering the economic factors globally. New customer demands, market trends and a huge competition with the compititors are the current scenarios. And these are having the factors like high varieties with varied volumes of the products. Without increasing the price of the product the competitions with the competitors are challenging task. For the company productivity, this can be only achieved through by reducing the manufacturing cost of the product by the use of less resources with an effective production processes. Toyota Production System (TPS) or Lean Manufacturing (LM) concept is the management philosophy which is mainly focused on the reduction of wastes in production process to improve the customer's overall value, this tool can help to identify waste and improves the quality by reducing time. Lean describe a system that produces what the customer wants and when they want it, with minimum effort. The seven forms of wastes in this regard is classified by Taichi Ohno as overproduction, waiting, transportation, inappropriate processing, unnecessary inventory, unnecessary motions and defects. Various researchers have pointed out the critical issues related with organizational drawbacks (1). To confront this challenge the organizations are tried to adopt Lean Manufacturing strategies. The implimentation of Lean manufacturing is not

an easy issue, therefore the industrial organizations realized the need for proper use of resources for each production facility and systems in an efficient and effective manner is most essential factor (2). Lean manufacturing is based on the Toyota Production System in the 1990s, they produce customer desires with minimum wastes and widely cited references in operations management and also helps in textile companies in their investigation of the benefits and barriers with other organizqtions (3). Implementation of lean manufacturing to the organizational problems during the manufacturing process and which are most beneficial to the researchers also. A list of such tools includes Value Stream Mapping, 5S, Kaizen, Kanban, Redesigning working cells, ,Total Production Syatems (TPS) can be used in any type of manufacturing process like automobile, aerospace, garment, chemical engineering. To reduce their waste in production process (4). The basic thing of lean production is "reducing waste". This method exceeds the number of protection within the given time. Normally textile industries have exist more amount of wastes, this will affect the societal factors in hazardous manner. Industrial waste is defined as unwanted Non Value Added activities (NVA) that exist during the production process. In this work the main intention is to avoid NVA activities through the Lean principles and improving product efficiency is the main criteria and based on the case study of a popular gokuladas garment industry considered..

## II. BACKGROUND

Due to the increasing labor wage in developed countries, the apparel manufacturing has been migrating from the high wage developed world to low wage developing countries (Bheda, Narag and Singla, 2003). Even though the labor cost is cheaper than in developed countries; due to the specific market nature of the garment industries for example: the short production life cycle, high volatility, low predictability, high level of impulse purchase, the quick market response; garment industries are facing the greatest challenges these days [5].

Textile field always considered as the backbone of our country after agriculture field. Apparel sectors and textile are ancestral business and also lacking of new technologies in their manufacturing methods In India, our country is a land of opportunities for textile and apparel industries. It is remarked that, this textile and apparel sectors are ancestral business, lacking to implement new technologies, replacing old traditional methods are required to reach the customer needs

in various verities with minimum cost. For the economic improvement and safe of an organization's industrial cost, quality of product, elimination of non value added activities are the most important factors to focus. For which the implementation of a Japanese management strategy called Lean Manufacturing concept can be an easy solution to solve today's organizational drawbacks, which can be identified and elimination of those wastages is one of the challenging task for the organizations in possible effective way. By using lean concepts, great productivity can do with simple changes in the organizational structure. And also great results can come from mastering a simple technique and applying it consequently is the main theme of this work, which is an amazing improvement in productivity of textile industry. Which can be achieved thorough small daily increments that lead to a specific action so the essence of Lean become a lot more intuitive and easy to understand. The ultimate goal is to reduce process waste. but the basic idea is to eliminate anything and everything that does not add value from the customer perspective. Another popular Lean tool Kaizen is a Japanese word, which involves two components like Kai (change) and Zen (for the better). It is a continuous improvement comes from Gemba Kaizen. Kaizen originated in Japan in 1950 when the management and government acknowledge that there was a problem in the current confrontational management system. First, it was being introduced and applied by Imai in 1986 to improve efficiency, productivity and competitiveness in Toyota, In this scenario, the Indian garment industries have witnessed substantial improvements in recent years. But the unnecessary capital investment is not going to solve the problem entirely moderately, this will turn out the waste in the long run. Here in this work, the implementation of lean manufacturing principles are greatly recommended, in order to identify the waste and to eliminate them. This research focuses the implementation of Lean tools in the production process of a textile industry to improve their productivity in a simple manner and minimum investment without any change in the real structure of the production system in the selected organization.

### III. LITERATURE REVIEW

Lean manufacturing is mainly focuses on the elimination of waste in every area of production processes including product design, factory management, supply chain activities, factors on customer relations, and. Its goal is to utilize less human effort, less inventory, minimum time to develop customer attractive products, and less space to become highly responsive to customer demand while producing top quality products in the most efficient and economical manner way. The literature review focuses on key concepts, developments and their revelation approaches of Lean Manufacturing tools like Value Stream Mapping (VSM) and kaizen principles and their practices and improvements. Companies such as Toyota, Pratt and Whitney, Sikorsky, Delphi, Ford and many other companies have achieved large savings by the reduction of

wastes by implementation of lean principles in their manufacturing processes (6). Lean manufacturing is an applied methodology of objective and scientific technique techniques where a process of minimizing Non-Value Added (NVA) activities can identify through the use of Value Stream Mapping (VSM) and Future State Map is useful to show the production process improvement in so many cases (7). The major application of VSM in the field of small furniture Production Company and its improvement is highlighted in better manner (8). Under the highly competitive environment, the garment industry has numerous opportunities for the improvement of productivity using lean principles (9). A Japanese car maker company describe a case study of kaizen costing methods used to set kaizen costs which will provide relevant cost data to support lean production decisions(10). Adopting lean tools and its methodologies by implementing continuous improvement programs that minimizes the product cost, faster delivery time and improves the quality of products clearly (11). A transport and logistics sector with some initial evidence of the adoption of LM in this industrial sector of Thailand.(12). After the literature survey, it is clear that not much work in context to VSM and Kaizen studies regarding garment industries have discussed in different ways and in different sections of the manufacturing process. In this way, here the main work is based on the lean principle implementation to a garment industry in a different manner to get their productivity is discussed in simple manner.

### IV. COMPANY AND PROCESS BACKGROUND

This paper is mainly focused on implementing Lean Manufacturing techniques in a medium scale enterprise, Gokaldas exports a textile industry, Unit-1, Hassan, Karnataka, south India, which is a pioneer in textiles mainly dealing with fabrication of cloths. The company has been dyeing, weaving and processing divisions, and approximately they have 23 manufacturing units It has over 20 equipped manufacturing facilities with a capacity to produce and export approximately 2.5 million garments per month, The company engaged in the manufacturing of apparel and clothing in India and abroad also. Gokaldas exports Limited started in 1995, which is one the largest exporter of garments in India the company has received ISO 9001:2000 certification for its quality management. The company mainly operates in two geographical segments in India and outside India and which is engaged in the business of design, manufacture and sale of garments for men, women and children's brands. It is the largest manufacturer and exporter of apparels in India with an annual turnover of US\$200 Million. It serves customers in the United States, Europe, Latin America, the Middle East and India. The important clients are Adidas, American Eagle, Benetton, Columbia, Nike, Puma, Reebok. The Gokaldas Exports, Unit-1, Hassan is having Currently 750 workers, including 450 machine operators and this unit has monthly turnover Rs 1,02,33,665. The process background, with key activities of selected garment industry usually practiced on shop floor includes the following steps sequential steps.

- 1) Initially as per the customer order design is made and it is marked on the marker sheet in design section.
- 2) The proper size of the material is calculated with proper allowances from the empirical relationships, existing database and their prior experiences.
- 3) Procuring the raw material of the desired quality, the pieces were cut into required size.
- 4) Thereafter, the various processes were carried out (fabric, cutting, sewing, inspection, packing)
- 5) To complete the process finally, finishing and cleaning operations are performed. The finished component is then sent to the customer.

#### V. PROBLEM DESCRIPTIONS

In our case study of a garment industry, it's high time to adopt Lean Manufacturing principles So that the company will possess minimum NVA activities in their process which can increase more productivity, flexibility in process with minimum time possibilities achievements in order to meet customer changing need and their demands successfully. In case study process observations, there are two major problems were occurring in the sewing and fabric sections, which leads to take more time and minimizes the flexibility in working atmosphere. Basically the fabric section and sewing sections have various problems such as the time taken for processing in fabric section is more due to poor layout structure and poor process flow from the fabric section to packaging section which needs more time due to this problem may lead to time delay in process. In order to avoid all these Non Value Added Activities (NVA) the company decided to implement effective Lean principles such as Value Stream Mapping to find the actual process flow delay and using Kaizen concepts for the respective areas of such different processes for the improvement of overall performance time in terms of productivity.

#### VI. RESEARCH OBJECTIVES

This research is focused on the application of Lean Manufacturing principles in sewing and fabric section of Gokuldas exports garment Industry as a strategy for their productivity improvement. The general objectives of this research work are discussed below as main points

- The main objective is to implementing the Lean Manufacturing tools like VSM and Kaizen principles in the specific areas of sewing and fabric sections of the garment unit taken as a case study of our research work.
- Flexibility will be improved and which is the current demand for the garment industry due to their frequent changes in fashion style.

- Labor cost will be reduced as less number of operations and operators will be required for doing the same amount of work.

#### VII. METHODOLOGY

The present study is descriptive in nature, aiming to explore the role of a set of problematic issues in the proper implementation of Lean Manufacturing principles in the field of garment industry, which has not been discussed in any of the previous works. The research was conducted in a multi phase approach using two sections in the garment industry. In case study-1, the improper layout is identified as waste and in case study-2 unnecessary movements and poor allocation of machines which causes waste respectively, for which the detailed methodological steps are defined SM symbols as follows in Fig.1. Value stream mapping is a Lean-Management method for analyzing the current state and designing a future state for the series of activities that take a product or service from its beginning through to the customer. VSM is one of the most effective which also show the right path to the management people to follow different works in product flow line. VSM which indicates all visual actions required to bring a product or service in right way from initial step to final stages. It show all the action both value added and nonvalue added activities currently required to complete a product or service to the customer. Here we can visualize product and information flow. For the multiple product line and entire operational activities we can draw the VSM. The first step is to draw the initial to final operations chart for the entire activities in current state. Then know the customer requirement and capabilities and constraints of the supplier. Then calculate clearly WIP through the consideration of Non Value Added activities (NVA) using the VSM tools. After drawing the map the next step is to analyze the map. Identify first the value added and non value added activities. Next step is to understand the customer requirement, recognize supplier capabilities and constraints. After that the current WIP is calculate. If possible make the production single piece flow, balance the line. After analyzing the current state VSM to find the Non Value Added activities then to reduce the NVA activities we can make some modifications With production layout of an garment industry. After that prepare Future State Map, then finally make some comparison analysis with current and Future state maps for the efficiency enhancement in terms of WIP before and after the implementation of lean manufacturing tools. In this way the layout change is one of the most effective tools of Lean Manufacturing concept in fact it is an integral part of the same. the systematic methodological steps followed to solve the problem is shown in below Fig.1.

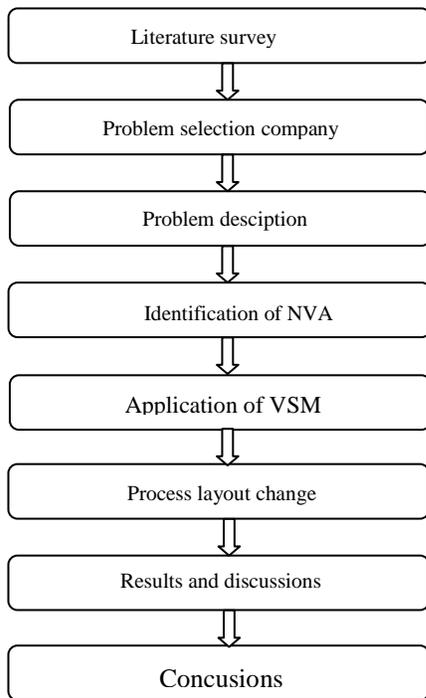


Fig.1 Methodology

VIII. CASE STUDY: VSM AND LAYOUT MODIFICATION

A. Problems identification

After studying the fabric section process, the following demerits are identified for the further modification through the application of Kaizen principle as follows in figures 2 and 3

- Insufficient space between racks.
- Absence of slopes at section entries.



Fig.2: Fabric section entrance



Fig.3: Distance between racks

B. Lean Implementation to process layout

In case study, the garment working process layout is studied in detail. The major problem occurred in the area of fabric section due to insufficient layout. The distance from a CAD section to fabric section is not feasible to start working instantly and the distance between fabric section to cutting section, cutting to laying tables, and between the cutting sections and laying sections also required to make modifications for the easy movements of trolleys. These modifications are required for the better productivity in terms of time minimization in the concerned organization. And the layout of fabric section before layout modification is shown in Fig.4

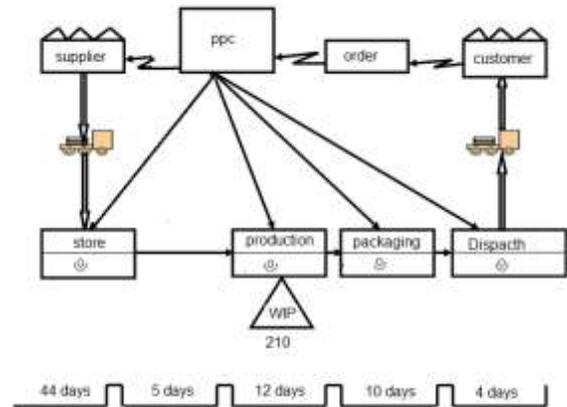


Fig. 4 Existing current VSM

C. After the implementation of Lean techniques.

After getting the clear picture through the application of current VSM technique, then the layout modification is made as per the requirement by considering minimization of NVA activities in the production process is shown in Fig.5 as revised new VSM chart. And After the implementation of kaizen principles from CAD section to cutting section, cutting to sewing and sewing to checking units have been changed and shown in Fig. 5

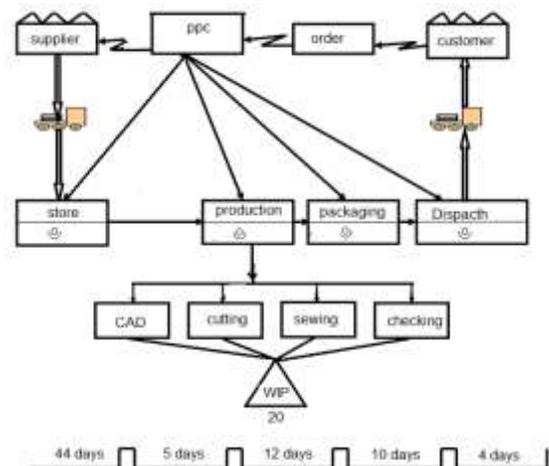


Fig. 5 Revised New VSM

In this case study, the production process of a garment is studied in detail. The major problem occurred during the process is insufficient distances allotted between the sections in their layout. The distance from a fabric to cutting and CAD section to cutting section are more during the operations. so that, modification of these distances will definitely help to improve the productivity in working process. Before the layout modification to the process, the total time elapsed from fabric section to packing section is 142 minutes shown in Fig. 6, and all the time is described in minutes only.

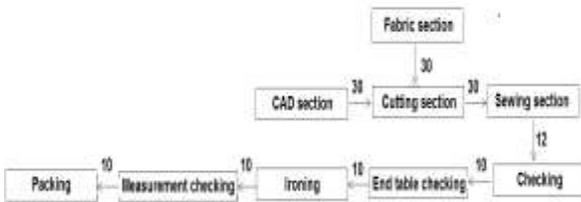


Fig. 6: Time chart before VSM implementation

But after the layout modification in production process. in Fig.7 Shows clearly, the total time elapsed from starting point to ending point is 105 minutes.

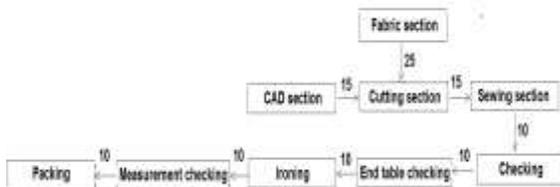


Fig.7: Time chart after VSM implementation

After the layout modification is made the total elapsed time in production process from fabric section to packing section is reduced from 142 minutes to 105 minutes shown in Fig. 8 and also the reduction of WIP is 210 to 20 based on the Fig. 4 and 5 respectively.

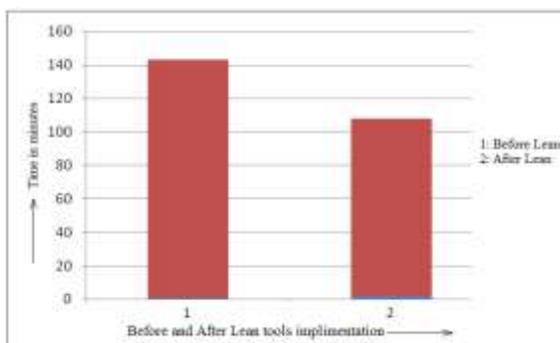


Fig. 8: Minimization of time due to Lean tools

### IX. RESULTS AND DISCUSSIONS

In this work, a case study is presented with the objective of discussing the implementation Lean tools like VSM for the process study and kaizen through the layout modification in production process of selected garment industry. with the minimum changes in the production process layout at the

entrance and fabric to inspection sections which gives easy movements between the sections and also which is helpful for the better transportation. After the modification of production layout, the total elapsed time reduces from 142 to 106 minutes and WIP reduces from 210 to 20 for the same time duration which is more than 80% of WIP reduction and provides balanced flow from machine to machine. Here the conclusion can be drawn as the implementation of lean tools can enhance the productivity by minimizing total elapsed time of production process definitely which is the continuous improvement in the process.. This study proves that, by the use of lean tools the company can survive with lower manufacturing cost, minimum time and quality product. the following possibilities are resulted as key points.

- Due to which, Flexibility will be improved by layout modifications in production system as the line can be changed immediately whenever needed.
- More than 80% Work in Process inventory reduction as the new layout will be arranged with the application of lean tools
- The number of operation required to complete the work will be reduced to greater extent by eliminating NVA activities.
- Number of operator or labor will be reduces as there will be no need of quality, hence the labor cost will be reduced drastically.

### X. CONCLUSIONS

This paper proposes the Lean Manufacturing tools implementation in a garment industry for the reduction of process time, WIP inventory in terms of profitability in a simple layout modification technique. Lean is based on waste management philosophy, the aim behind the above lean tools implementation are purely on waste reduction basis for the existence of the textile industry. as a future enhancement of the work to additional lean concepts and principles are motivated to induct for the better results as profitability through waste management reduction criteria.

### REFERENCES

- [1]. Worley, J. M., & Doolen, T. L. (2014) "Organizational structure, employee problem solving and lean implementation" International Journal of Lean Six Sigma, Vol-6, No.1, pages- 39-58
- [2]. Bayat, H., & Dadashzadeh, M. (2017) "The impact of organizational factors on implementation outcomes of lean manufacturing" Journal of Business & Economics Research (JBER), Vol-5, No.2, Pages-33-44.
- [3]. Holweg, M., (2006) "The genealogy of lean production" Journal of Operations Management, Vol-2, No.25, Pages-420-437
- [4]. Laureani, A., & Antony, J.( 2012) "Critical success factors for the effective implementation of Lean Sigma" International Journal of Lean Six Sigma, Vol-3, No.4, pages-274-283. <https://doi.org/10.1108/20401461211284743>.
- [5]. Lucy Daly, M.B. and Towers, N. (2004) Lean or Agile: A Solution for Supply Chain Management in the Textile and Clothing Industry. International Journal of Operations & Production Management Vol. 24 No. 2, p. 151-170.
- [6]. Schmidt.M. (2000) "Application of lean principles to an enterprise value stream a lean analysis of an automotive fuel system

- development process" International Journal of Production Research, Vol-15 No.6, Pages-553-64.
- [7]. Rajenthirakumar, D., Mohanram, P.V. & Harikarthik, S.G. (2011) "Process Cycle Efficiency Improvement Through Lean : A Case Study", International Journal of Lean Thinking, Vol-2, Issue-1, Pages-47-58.
- [8]. Geoff Miller, Janice Pawloski & Charles Standridge. (2010) "A Case Study of Lean, Sustainable Manufacturing", Journal of Industrial Engineering and Management, Pages-11-32.
- [9]. Mercado, G. (2007) "Question Garments - Ask the Lean Manufacturing Experts Applying Lean in the Garment Industry Retrieved" January 12, 2008, Thomas Publishing Company .
- [10]. B. Modarress, A. Ansari & D. L. Lockwood (2005) "Kaizen costing for lean manufacturing: a case study", International Journal of Production Research, 43:9, 1751-1760, DOI: 10.1080/00207540500034174.
- [11]. Patyal, V.S. and Koilakuntla, M. (2017), "The impact of quality management practices on performance: an empirical study", Impact of QM practices on performance, Vol. 24 No.2, Pages.511–535.
- [12]. Jose Arturo Garza-Reyes, Sarita Tangkeow, Vikas Kumar (2018) Proceedings of the International Conference on Industrial Engineering and Operations Management Bandung, Indonesia, March Pages-6-8.