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Study and Implementation of Visual Management System in a Shirt Manufacturing Unit

Kavya Jhanji
National Institute of Fashion Technology, Bengaluru

Abstract

Due to increased customer demand and global competition, on time delivery with quality for the Indian apparel manufacturer has become important. In RMG industries, lead time is decreasing day by day. In order to reduce wastage of time, resources and money, lean tools are implemented. Lean tools are simple and do not require a lot of investment for good results. There is limited study on implementation of lean manufacturing system in garment industry. The primary focus of the study is on the implementation of one of the lean tools, viz. Kanban Management System, in a shirt manufacturing unit. The production reports and production flow was analysed to understand the root cause of the problem. After indication, improvement proposal is given to the industry from which the productivity as well as line efficiency has compared before and after applying the techniques.The report is then analysed after the time duration of three months.Also the positive change in the working environment due to implementation is analysed.

Keywords - Just-in-Time (JIT), Lean manufacturing, Productivity, WIP management, Shirt manufacturing, Garment Industry, Fashion Industry

1.Introduction

Due to recession at the beginning of twenty-first century, many organizations worldwide were forced to reduce cost and become more responsive to demands of customer. Lean production is usually associated with large-scale automotive production. Rather Lean is also extremely compatible with small and medium enterprises or SMEs. Smaller companies face real planning challenges, but are less likely to implemented Lean. Resultantly, small and medium enterprises are missing an opportunity to become more efficient and competitive. Lean tools are simple and do not require a lot of investment for good results. Lean tools are flexible and don't need complex IT systems to work well. Lean requires discipline to establish processes and to measure performance having a very positive impact. There is limited study on implementation of lean manufacturing system in garment industry. Kanban in Japanese means signal or card. Kanban authorises the upstream process to produce only when there is a requirement for production, and is an effective system to eliminate losses occurring due to over-production. Kanban system uses visual signals to trigger the flow of materials from one part of the production process to the other. By utilising a Kanban system, smaller lot sizes and huge inventory reductions can be achieved. This enables to keep inventories of raw material, subassemblies and finished product to a minimum and to adopt lean manufacturing principles eliminating inventory as a source of waste. The study primarily focuses on the implementation of one of the lean tools, viz. Kanban Management System, in a shirt manufacturing unit with a capacity of 2500 pieces/day.

2. Study Background

The study is conducted in a shirt manufacturing unit of an Indian domestic retailer. The retailer has an in-house manufacturing unit of shirt, trouser, blazer and suiting. It has a capacity of 2500 pieces/day. The manufacturing unit has 10 departments with material follows a linear flow of store, cutting, fusing, embroidery, part preparation, assembly, finishing and packaging department. The unit follows a bundle system and assembly line manufacturing. The cycle time for each unit is 27 mins. It consists of 280 sewing operators, 30 cutting operators and 30 finishing & packaging workers. It works on an efficiency of 68% with an absenteeism of 5-8% and an attrition rate of 15%. The shirt manufacturing unit consists of various departments, viz. fabric check point, fabric store, trim store, cutting department, fusing department, embroidery department, sewing floor, finishing department and packaging department.

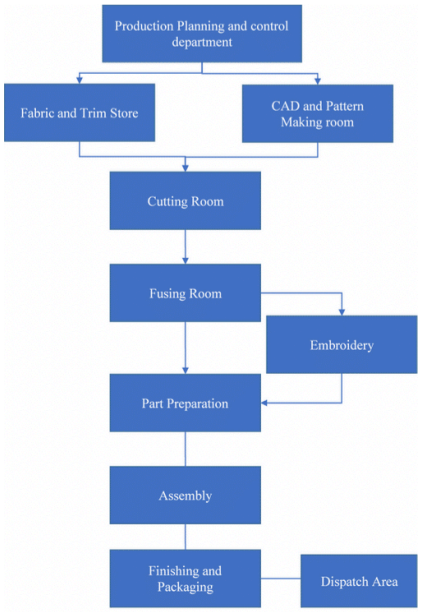

Figure 1.1 - Process Flow chart

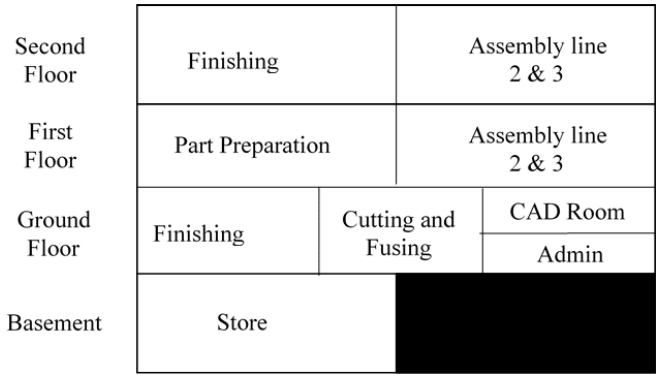

Figure 1.2 - Floor Plan of Manufacturing unit

2.1 Work flow analysis for cutting department

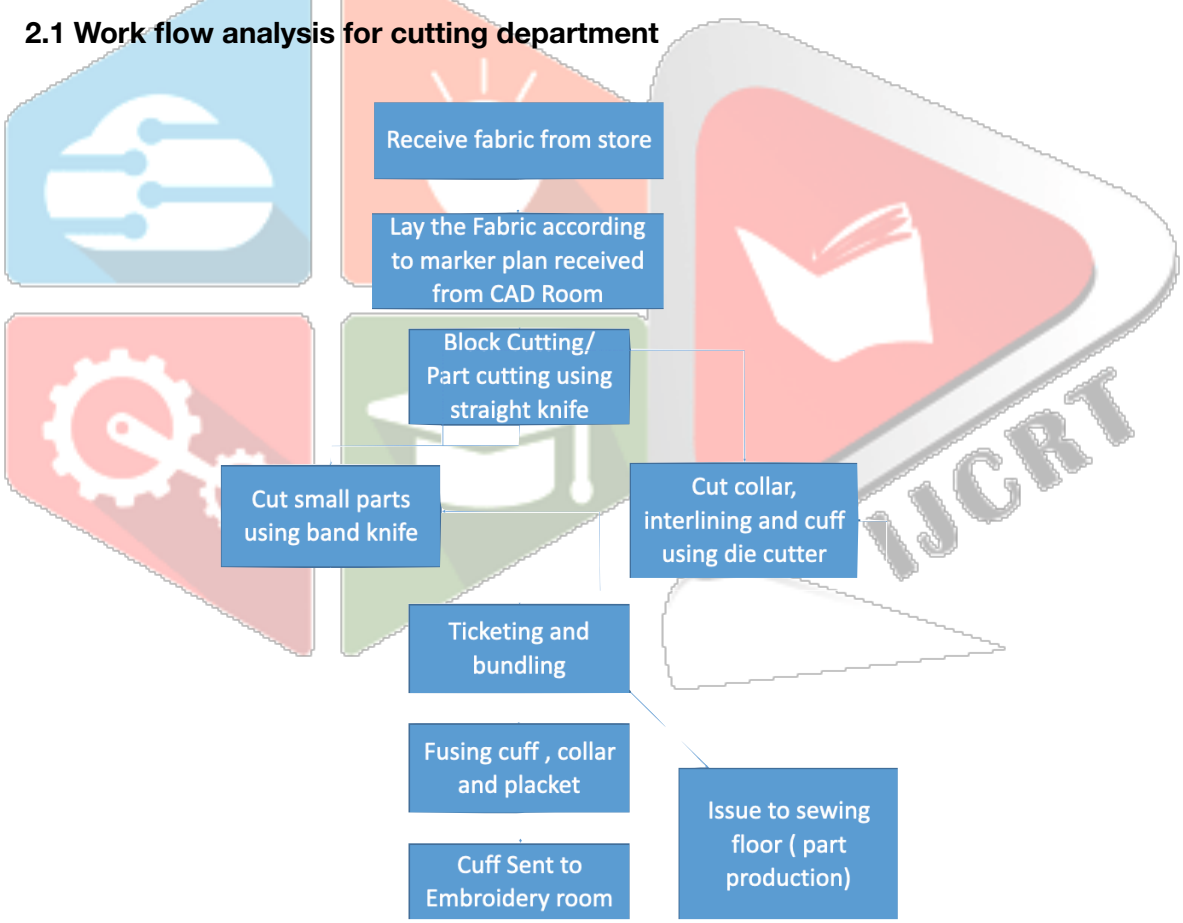

Figure 1.3 - Work Flow Analysis (Cutting Department)

Cutting room receives fabric from stores and CAD paper pattern from CAD room. The first process followed is laying the fabric. The process of laying is done on three tables of 7, 7.5 or 11 meter depending on requirement. After laying pins are inserted and simultaneously while pinning process is followed the layers are cut using straight knife and other auxiliaries like weights and lay holders. If the process contains checked fabric after laying and block cutting the fabric, the process of mitering and final cutting is followed by band knife cutting. In checked mitering increases the spreading and laying time by five times the normal time approximately.For cuff and collar , die cutting machine is used to cut them hence making the cutting accuracy maximum ensuring minimum defects due to cut part inaccuracy. While cut pieces are separated and kept they are collected by the ticketing and bundling workers to ticket them and send forward for fusing, embroidery or for further processing.The defected fabric parts are recut from blanketing fabric at later stage. Brown paper insertion method is used for defects in fabric rather than

splicing. Hence decreasing time consumed in marker making but the parts with defect are cut from the same lot of the part later.For fusing the collar , double fusing is used to increase the fall. One is called skin which is a woven fusing and other is called fixed which is dot mesh non woven fusing. Before sending the parts to the fusing belt they are laid on a paper and then using soldiering machine interlining are fixed onto the fabric to avoid any misplacement in fusing belt. Paper base for placement is used to increase number of parts fused in one go.
There are two fusing belt one is used to fuse the placket and other is used to fuse cuff and collar parts.

2.2 Work flow analysis for sewing department

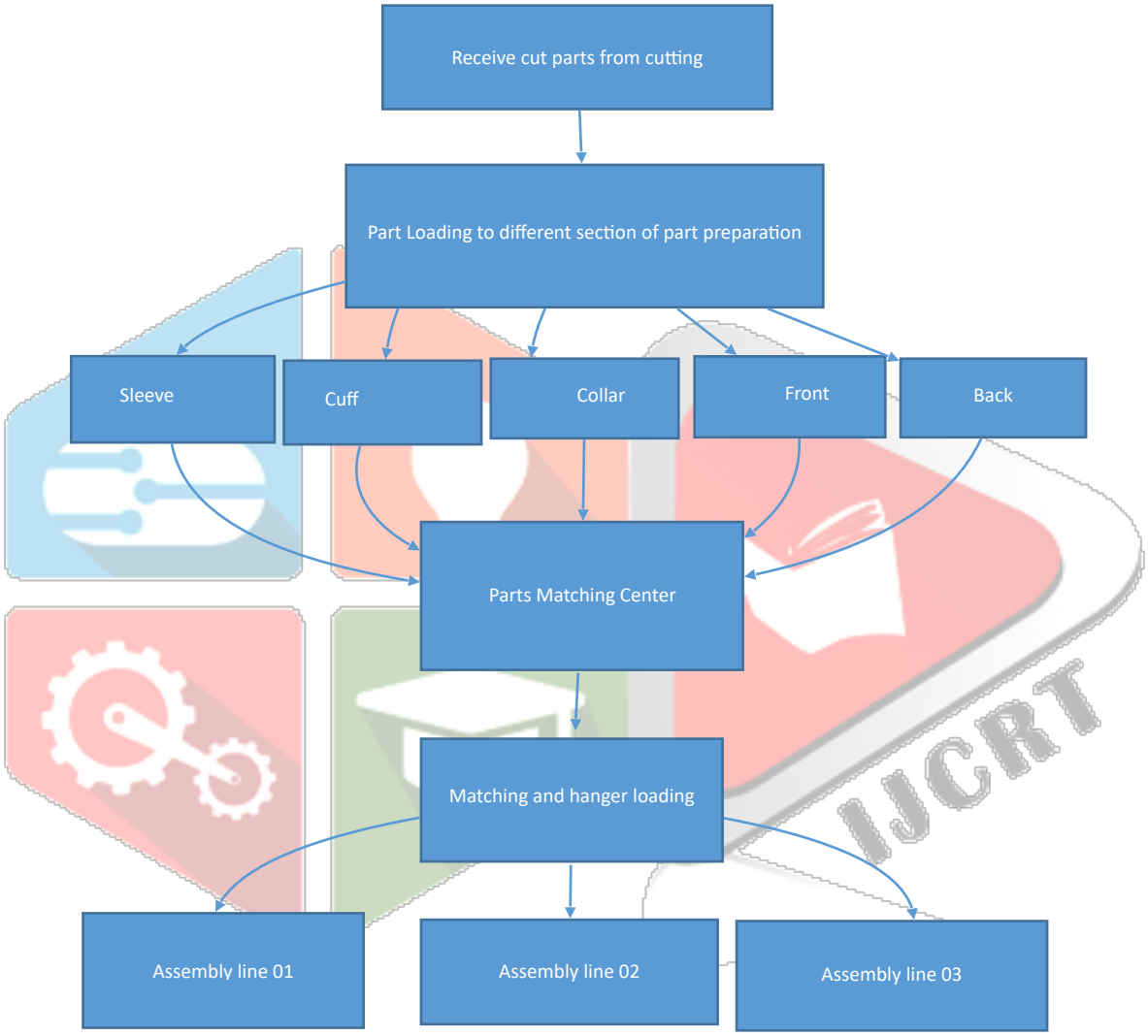

Figure 1.4 - Work Flow Analysis (Sewing Department)

Cut and fused part are received from cutting department which is loaded to various part production lines, that is , cuff, collar, sleeve, front and back. Once processed into parts they are checked in end line and bundled to send to centralized matching center wherein the parts of same bundle are matched and loaded together to the assembly lines. AVM has three assembly lines which has around 100 hangers each. They use over head assembly system.
Various folders and attachments are used to boost up production like pneumatic folders , yoke attachment folder, armhole attachment folder, Overhead lights for critical operation, binding folders etc.

2.3 Work flow analysis for finishing department

Finishing section add value to the product which attracts customers by the presenting activities of the product according to head office's requirements. Finishing department carries out various functions like thread cutting, rework station, spot removal, ironing, packaging, packaging trim attachment and to pack in cartons and make it ready for dispatch.
Finishing department has various machines like thread suction machine which due to air suction pressure removes all excess unwanted thread and lint from the garments surface giving an excess thread free

garment, The spotting station has various chemicals to remove the dust , lint and spots formed during the process of production. There are various shirt folding machines which fold the shirt and make it ready for packaging in lesser time as comparative to manual folding process.

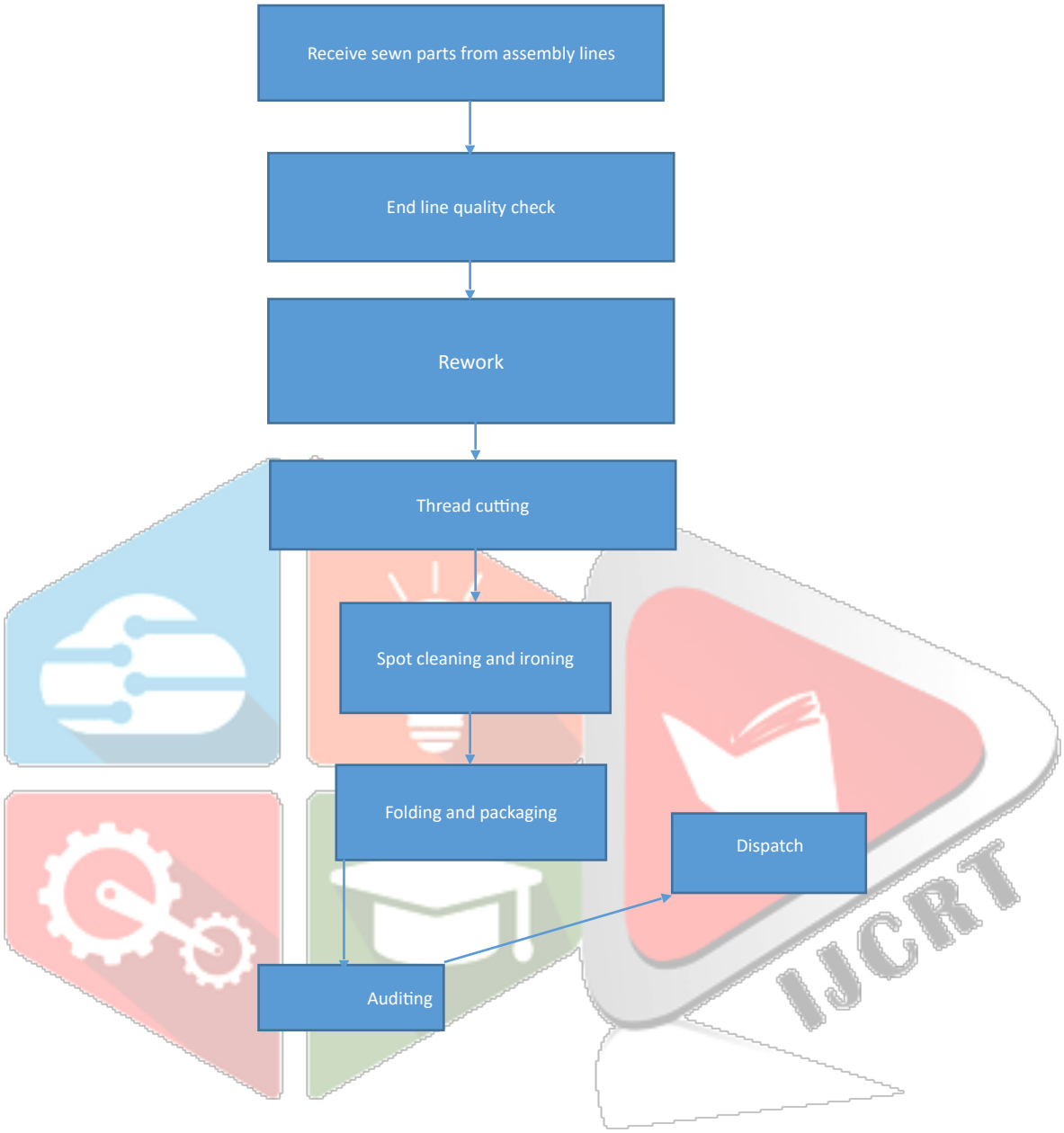

Figure 1.5 - Work Flow Analysis (Finishing Department)

3. Literature Review

Kanban system denotes a visual system or a signal system which controls the logistic chain, hence, supporting the production. It is a major component of Lean Manufacturing. Kanbans are used to control material flow in production and by following the downstream demand. For implementation of kanban system, the material flow is analysed to identify the problem areas and to limit the work in progress in the production.

The classic Toyota Pull system is associated with a Kanban approach to a decentralized production scheduling. Kanban means visual card. A Kanban card is attached to a part with a part ID number written on it, and it may contain additional information, such as the name of the supplier if it's a supplied part, or the location of stores if it's an item from storage, or where that part is needed, and so on, and often the kanban is placed in the bottom of a container, and when the material in container is used up, then the card is taken out and inserted on the side of the container. When the parts are removed from an inventory location by a receiving production step, the receiving workstation then sends a signal to the sending workstation to initiate a replenishment of the stock, and this is done via the posting of a kanban card of the product withdrawn from stock. The [sending] workstation then is authorized to produce the missing parts, when it has the authorization in the form of a Kanban card from the receiving workstation and the

required parts from its own supplier workstations. Kanbans facilitate inventory control in production. Kanban systems allow control of the work in progress, as standard containers hold specific amounts and as only one container-full is produced or moved at a time. The production or movement is carried only as authorized by the Kanban, which means there can never be more inventory between two resources than what has been authorized by the Kanban cards. The upstream resource can only produce when it receives a Kanban, and production is stopped when that amount is produced, so we limit the inventory by the number of containers allowed. But this also allows fine-tuning of the process, as a specific number of containers and Kanban is used.

There are key Kanban rules:

1) **Quality at the source -** Never pass defective parts onto the next work station
2) **No push -** The receiving process withdraws from the sending process, the sending process never delivers to the receiving process.
3) **Pull authorization -** The quantity of the parts produced always equals the quantity of parts withdrawn and is marked on the Kanban card: so again this idea of control via the containers and the Kanban. Parts can never be produced or move without a Kanban card.
4) **Card attachment -** The Kanban cards are actually attached to the parts or boxes containing the parts,
5) **Number matching -** The number of parts in a container always matches the number on the Kanban card.

4. Objectives

1. To study and understand Kanban Manufacturing system
2. To implement Kanban Manufacturing system in shirt manufacturing unit

5. Diagnosis of Problem

The manufacturing unit had excessive WIP(work in progress). Reducing WIP was important since it involves investment, profitability depends on it and in case of perishable item WIP inventory has a shelf life. Maintaining a limit on WIP helps to streamline the flow and increase productivity. There were recurring delays delivery of orders due to mismanaged production. The pieces were being produced according to push system instead of pull system leading to mismanaged order quantity produced per order. The management were unaware about the order being produced due to lack of a visual system. There was unavailability of few parts for feeding it to the assembly line leading to huge amount of WIP in inventory between part production and assembly line.

Need of the implementation-

1. **Delay in orders -** There was lack of communication between the management and supervisors in terms of the order which is ranked prior. Hence the orders with nearer dates are ignored and create a delay in production.
2. **Excess Inventory and work in process -** There was increase in WIP due to multi-style part production, hence, increasing the inventory. Since each and every part has to be produced in order to load it in for assembly.
3. **Unpredictable production -** It was unclear to the management in production floor about the upcoming orders and orders in process due to involvement of large data excel files to judge the prioritization of orders. Hence predictability and involvement of the whole management to be project driven was less. The major priority of each line was to make most number of pieces regardless of the importance of one particular order.
4. **Push System Driven -** The production is more driven in pushing the output rather than pulling the order.
5. **Unsynchronized production processes -** Production held due to unavailability of cuff parts. Due to unavaibility of single part from all the parts stops the pieces to go further for assembly hence increases the WIP and inventory and increases risks involved with higher wip.
6. **Uninformed Management -** Management is unknown of the fact that few parts are produced more in number while few are less in number leading to slowed down assembly.

5.1 Problem Analysis

There are three major contributing department to the shirt manufacturing process ie Cutting , Sewing and Finishing. Hence a kanban system is established in these three departments.

The aim of the kanban implementation system is to simply communication and involving management by providing information that what is getting produced, what to produce and what quantity to be produced to influence the production to demand driven.

Main objectives to implement kanban management system in three major department is

- To force to make efficient process.
- To reduce inventories
- To diagnose weakness in process.
- To reduce lead time.
- To Reduce scrap and rework.
- To increase flexibility.
- To make production more transparent and visual
- To create communication stronger within the work area
- To enforce pull system with the lines
- To make production more predictable
- To make the production more visual

A visual system had to be implemented to reduce the mismanaged flow of material. A kanban board is implemented in assembly line. The assembly line indicated its requirement several different input materials, which can be seen through a visual board. Each of the input materials has one or more containers. The colour of the container represents the status, so when a container is empty the operator will set that particular colour to red. If the colour is the material arrives at the line and the container fills up then the colour is in green, and the status is "full." Other colours could show other statuses such as, that the materials are "in transit" or "being filled" or if maybe a container has an error. Similar system is implemented in cutting and finishing department.

Figure 1.6: Kanban Visual Board

6. Result

Due to implementation of visual signal system, the production was streamlines and the output increased by 20%. The pieces were more trackable and production became more streamlined. The inter-department and intra-department communication also improved.The inter-department WIP reduced by 30%. The lines became more flexible and also reduced the idle time of operators since operators didnt have to wait for the pieces to produce. Also, the space occupied by in line inventory reduced by 50%.

Table 1.1 : WIP Report as on 13/06/2019

WIP MANAGEMENT REPORT on 13-06-2019		
Output	**WIP**	**QTY**
1800	Cutting	12861
	Sewing	25664
	Finishing	32262

Table 1.1 : WIP Report as on 14/08/2019

WIP MANAGEMENT REPORT on 14-08-2019		
Output	**WIP**	**QTY**
2208	Cutting	10024
	Sewing	19972
	Finishing	20580

The WIP reduced by 30% whereas the production per day increase by 20% due to implementation of the visual system. One of the biggest of the seven wastes is that of inventory. Implementation of the system resulted spontaneously in reduced inventory, minimum damage to the materials and higher clarity in the material flow. Gross and net profits of the company are bound to escalate as a direct result of the appreciably reduced inventory costs.

7. Conclusion

Lean tools have a great positive impact in garment manufacturing unit. It enables to keep inventories of raw material, subassemblies and finished product to a minimum and eliminate inventory as a source of waste. In current state assessment it was found that Production Capacity per shift (in pcs) is 2200 and efficiency increased by 20% which shows huge opportunities for further improvement. The future work may include helper less zero defect line where each operator will be the quality at the source and creation of standard operating procedure (SOP) for each sections and for incentive policy also.The lean tools are well suited for reducing and managing the apparel manufacturing waste.

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