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IMPROVING EFFICIENCY IN GARMENT INDUSTRY BY IMPLEMENTING SINGLE PIECE LINE PRODUCTION SYSTEM

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ABSTRACT

Apparel manufacturing industries are trying to develop their current production system and situation and continuously looking for new production tools and techniques to keep swiftness with the rapid changes of trend in consumers of apparel products. To deal with the recent problems & challenges industries must improve production efficiency & productivity; reduce lead time, ensuring proper quality requirements. Proper planning and execution is not practiced and works are not standardised. The people mentality and organizational antibodies who resist change is one of the major bottle neck for implementing lean in the industry. The major problem faces by this exporter due to those above restrictions are delaying the shipment date which leads to either Air Shipment or even cancelling of order. Good will and reputation of companies are dropping down which eventually leads to loss of customer. Lean tools and techniques which cuts down the fat in manufacturing process makes the industry lean and agile to move dynamically with the competition. In this paper problems faced in implementing single piece line production in a garment industry is explained, and how some standardization helps in reducing time and improving quality in garment manufacturing.

Keywords: *Garment Manufacturing, Shipment Delay, Lean in Garments, Line Production, Standardization.*

I. INTRODUCTION

Tirupur is one of the largest foreign exchange earning towns in India. There are some 7,000 garment units in the town that provides employment opportunity to close to one million people. The first spot of any international buyer for Indian garments is Tirupur. [1] Buyers from 35 countries frequently visit Tirupur. Tirupur can deliver customized samples in less than 12 hours; half a million pieces in a matter of days. Fifty-six per cent of India's total knitwear exports come from Tirupur. Now a day's apparel manufacturing industries are trying to develop their current production system and situation and continuously looking for new production tools and techniques in order to keep swiftness with the rapid changes of trend in consumers of apparel products. To deal with the recent problems & challenges industries must improve production efficiency & productivity; reduce lead time, ensuring proper quality requirements.

The sector rapidly attained high importance in terms of employment, foreign exchange earnings & its contribution to GDP. Many reputed buyers come here for lesser labor cost with high quality of product; but the training, capability, efficiency & productivity of labor in sewing section remain ignored throughout the whole time. Assembling apparel is a laborious process where in a simple tee-shirt producing sewing line consists of 25-50 workers with 18-40 sewing machines. So, capacity variation occurs here very frequently as working capacity differs from men to men. When worker changes capacity of work also changes accordingly. For this type of variation balancing the maximum and minimum capacity is a challenging step for floor managers.

II. PROBLEM DEFINITION

In general, Garment manufacturing is carried out with "Progressive Bundling System (PBS)". Each PBS is setup for exclusive product. Compare to other sections in the garment production, sewing room handles high skill jobs with high quality requirements. PBS system generates high amount of WIP, thus throughput time as well as the rework time area alarmingly high. Line balancing between the operations is a critical task, with defective parts being hidden in between the products, so that many garment professionals work like fire fighters. Secondly PBS system does not provide flexibility, which is the current requirement in the garment industry with decreasing order size and increasing the number of styles. To meet such requirement product layout should be designed for minimum WIP between the processes creating flexibility to change the order quickly with minimum line setting time.

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III. LITERATURE REVIEW

Benefits of the Single-Piece Flow systems are as followings [4]: Reduces throughput time - Time required coming out pieces from the production line after feeding is quicker than traditional progressive bundle system. Reduced throughput time of an order has many other subsequent benefits. Quicker response – This system reduces overall lead time for an order processing. Factories can response to market demands quickly. Faster money circulation - In this system no much inventory is stored and production lead time is less. Factory doesn't need to block money in lot of material purchasing, transportation and warehouse. Easier to change product - Setting up a line for new order or a new style is easier in one-piece flow system. Style changeover time is also less compared to progressive bundle system as there in no much WIP in the production line. Improves garment stitch quality - Due to less throughput time, faults are detected quickly and feedback on stitching quality is given faster for preventive action. Also in lean manufacturing one-piece flow system quality is in-build [3]. This means each operator is responsible for checking quality of the work. No defects passed to the following operations. This way defect generation at machines can be reduced. Secondly when there are fewer defects in garments, quality checker checks a garment in less time compared to exiting production system. Reduces rework level – Fewer defects mean less rework. Better quality control – In this system, as any fault is detected within minute of its occurrence garment quality can be managed in a better way. Improves labor productivity – Productivity in a single-piece flow system is higher than a batch production. Reason – Non-value added activities are eliminated in one-piece flow system. Thus, operator can produce more standard hours in the given time. Better line balancing –Equal work distribution to operators can be done by clubbing low work content jobs. Thus, minimum bottlenecks exist in the line.

It is considered that cost of manufacturing for smaller quantity order is less in a single bundle system in comparison to progressive bundle system. Garment industry in Tirupur is unaware of the loss they make by reworking. The industry just focus on meeting the target and getting new orders. The focus is not brought to removing non-value added cost to the product which can add profit margin. Improved profit margin helps to uplift the standard of production and which in turn reduce the toughness in competing with international exporters.

Japan initiated system of lean manufacturing which maximises the resource utilisation is a systematic method of eliminating non-value added activities in manufacturing. One of the major non-value added activity is producing defective products. The garment industry which we took for analysis produce 27% Defective garments (Considering past 6 months' data from July to Dec 2016)

27% Rework is equal to 27 % excess in production cost [5]. This also adds to the lead time for delivering. Defective garments add material cost, Labour charges, Machine utilization, and it can also lead to delayed shipment. Delayed shipment leads to air shipping which is 6 to 7 times that of normal shipping.

IV. METHODOLOGY

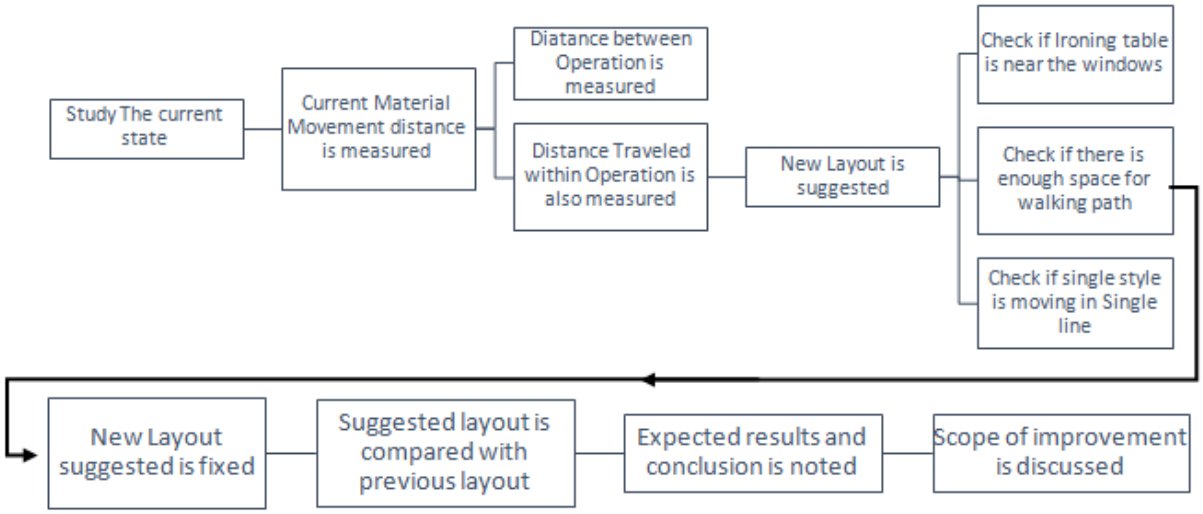

Fig 1: Methodology flow diagram

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The methodology shown in Fig 1 is used for implementing the process. The primary objective is to Increase the Accountability by implementing single style flow line from feeding to sewing to Carton Packing. Simplifying the production line planning, Forecasting and Scheduling will by easy by identifying the status of the line. Minimizing Work in Progress (WIP) in Production line and increase shift Labour productivity which in turn helps to stop dependency of contract labours (Piece Rate Workers) The final but very critical objective is to increase Customer PPM and Increase End customer satisfaction by improving quality which is due to low material movement and handline.The current State Material flow is shown in layout given in Fig 2.

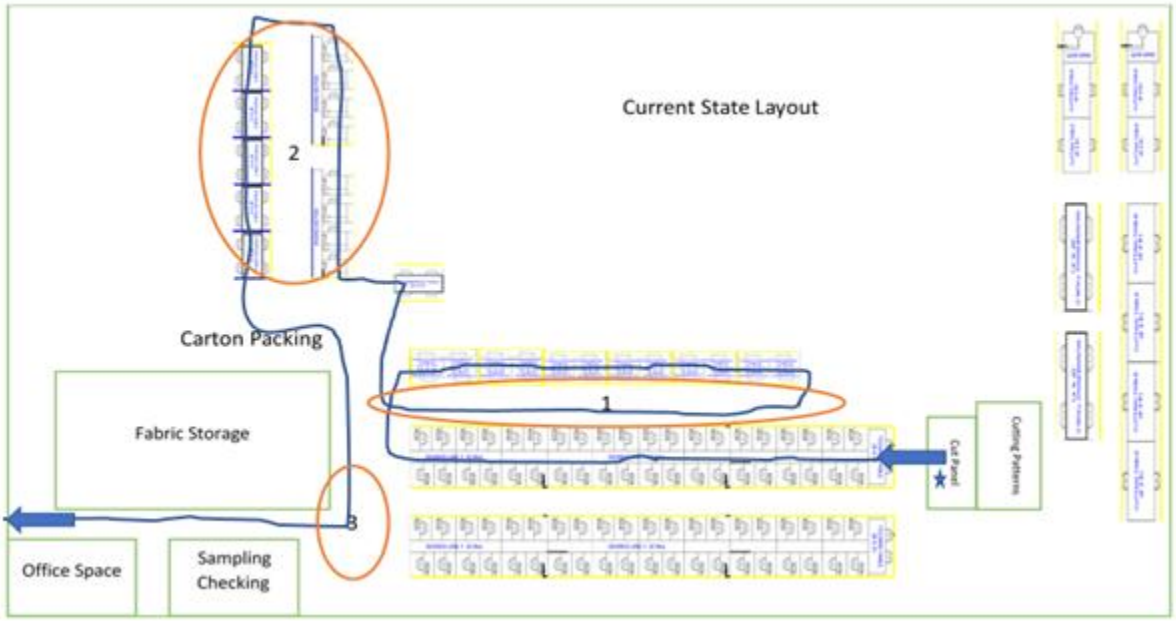

Fig 2: Current layout: 80 Machines Layout (Material Movement 170ft.)

Suggested changes

The old layout was having separate checking table kept separately parallel to the sewing line and the pieces which is done with the sewing is taken in bundle to the table. There is no specific feeding side or receiving side for trimming and checking. It was very tough to know the status of the product and accountability is also minimum it is changed to End Line Checking which is very effective and gives style wise accountability and status of the work in every movement. Online ironing and packing is done which avoid dependency of contract workers. More space is allotted for carton packing and it is kept near exit door for easy shipping. Ironing table is kept at end near the window so that steam can pass through it. Sewing line length is reduced to 22 Machines per line and 2 trimming machine from 40 Machines and 2 Trimmers, Short Strong Sewing lines as shown in Fig 3 gives quality products with improved throughput.

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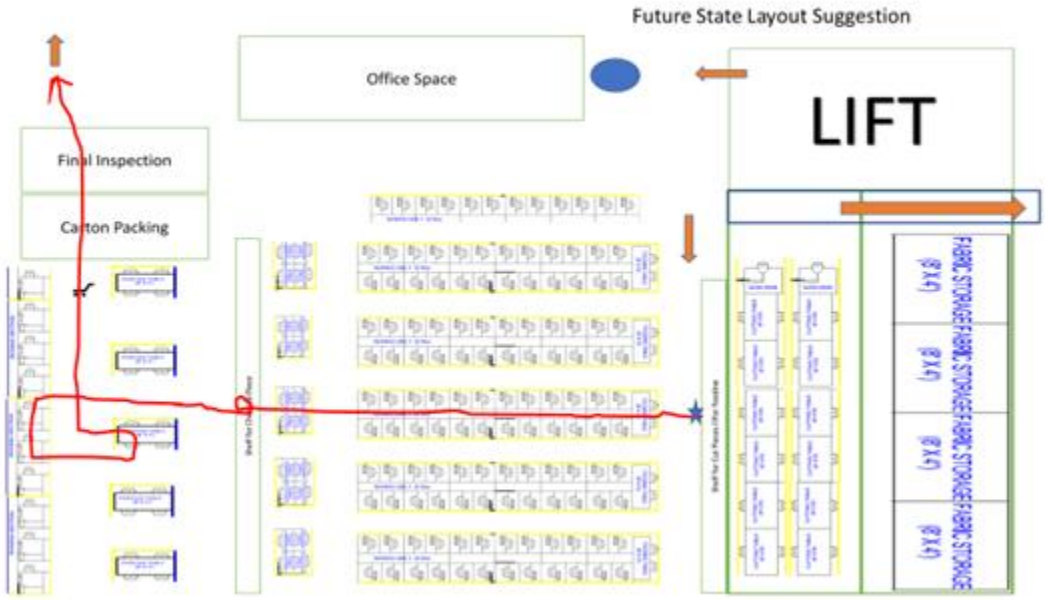

Fig 3: Suggested New Layout: 120 Machines layout. (Material Movement 88ft.)

V. RESULT

NO	FROM OPERATION	TO OPERATION	DISTANCE BEFORE (FT.)	DISTANCE AFTER (FT.)
1	Cut Panel	Feeding Table	4	4
2	Feeding Table	Sewing Line Starting	2	2
3	Sewing line Starting	Sweing Line End	72	32
4	Sewing line End	Trimming	2	2
5	Trimming	Checking	12	5
6	Checking	Sorting Table	14	2
7	Sorting Table	Ironing	5	14
8	Ironing	Packing Table	14	4
9	Packing Table	Carton Packing	10	13
10	Carton Packing	Exit	35	10
		Total	**170**	**88**

Fig 4: Comparison chart for the material Movement Before and After Implementation

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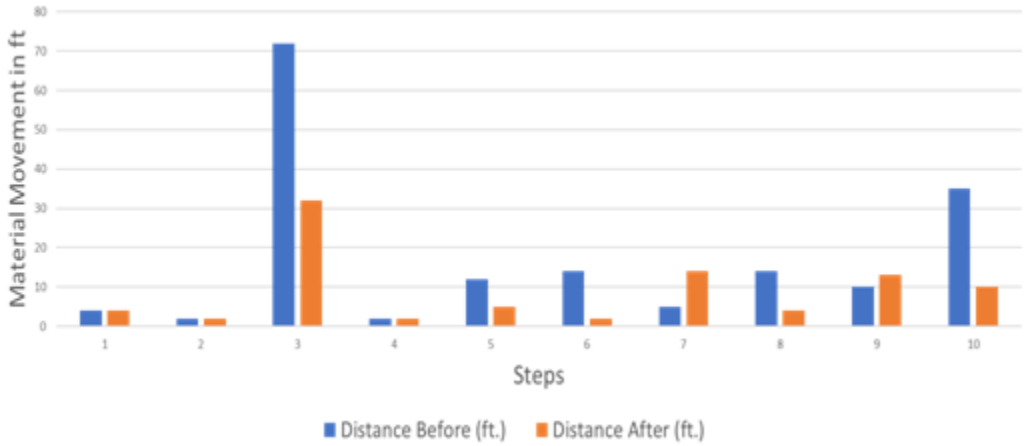
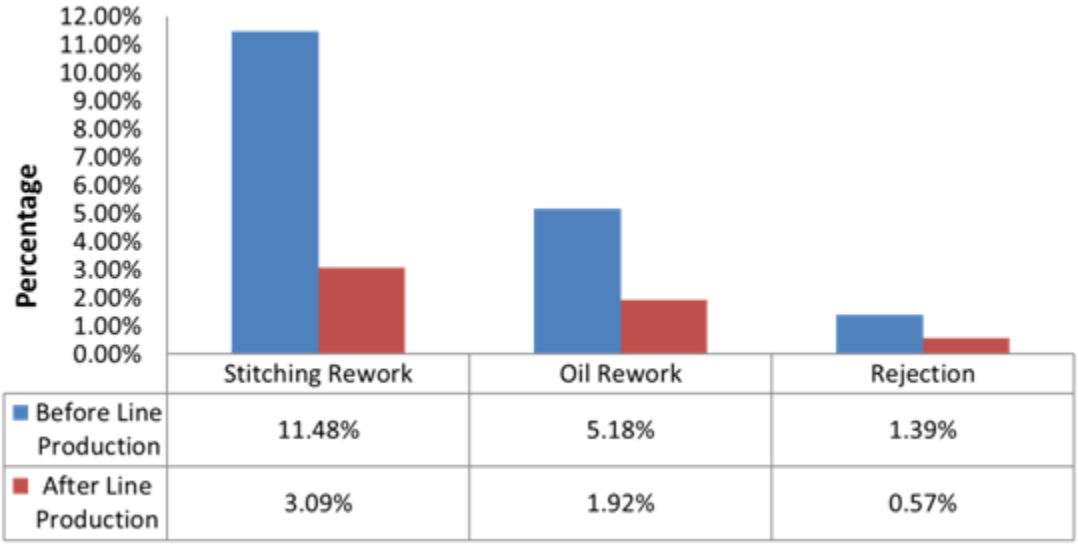


Fig 5: Graphical representation of improvement before and after layout modification



	Stitching Rework	Oil Rework	Rejection
Before Line Production	11.48%	5.18%	1.39%
After Line Production	3.09%	1.92%	0.57%

Fig 6: Quality Improvement before and after Implementation

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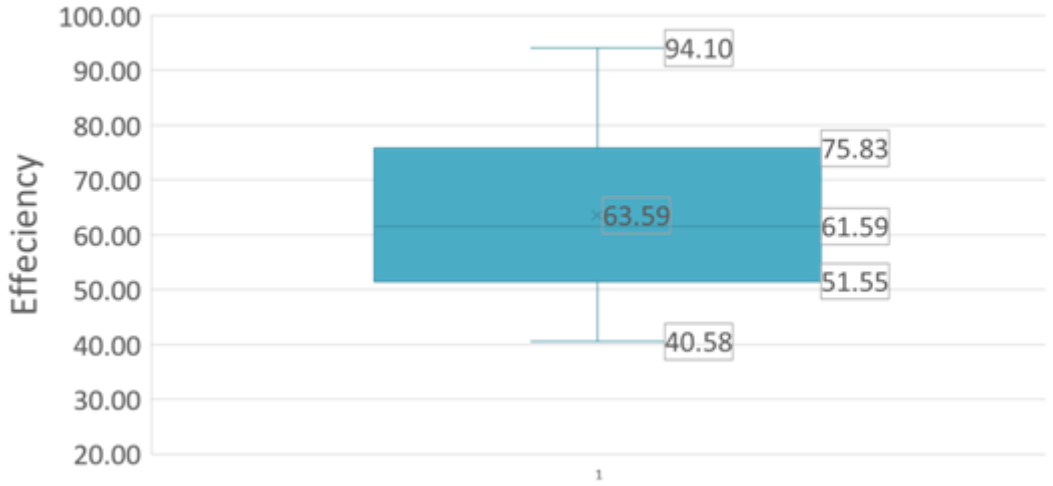

Fig 7: Box Plot Showing Operator Efficiency before implementation

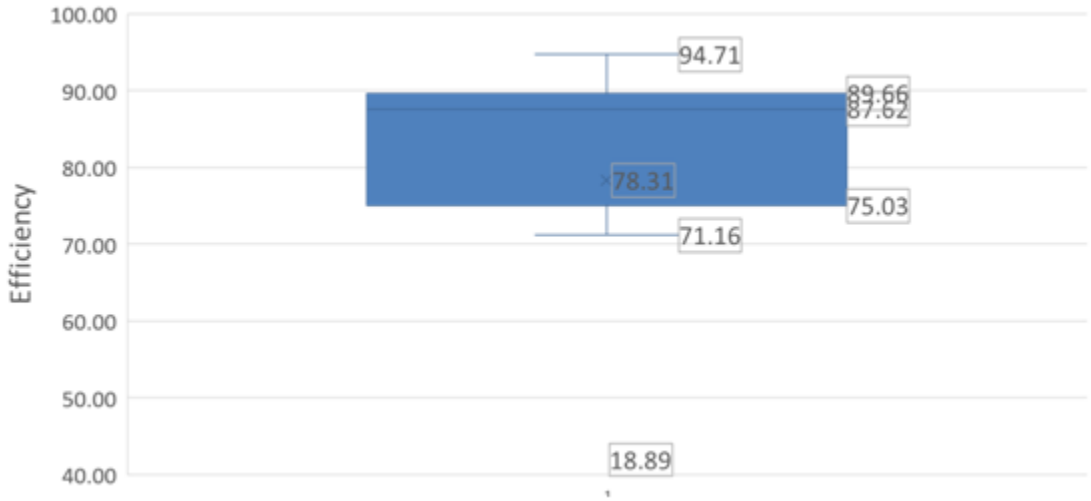

Fig 8: Box Plot Showing the variation of operator efficiency after implementation

The box plot in Fig 7 shows the efficiency of sewing operators, before implementation the operators will have bundle of pieces to stitch. It was tough to meet the target production per day. The average output to the maximum output which is calculated by multiplying the cycle time with working hours per shift. When it is with single piece line production (Fig 8) the operator will be noted if he stops the operation since piling up of garments happens. The machine maintenance person should be available on call because the whole line will stop if there is any machine stoppage in between the operation.

VI. SCOPE OF IMPROVEMENT

Visual controls and Andon signals [6] can be kept in each sewing machine for tracking the availability of the machines. Quality can be tracked and poka-yoke can be made. Kaizens can be made for productivity improvement and Cost reduction inside production floor.

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VII. CONCLUSION

- Material Movement is reduced from 170 ft. to 88 ft.
- Single line flow for single style is made to improve material accountability, from cut panel rack till carton packing each style take its own separate path.
- Operator Efficiency is improved from 63.59% to 78.31%.
- In house Quality of product is improved by reducing the stitching rework level from 11.48% to 3.09% and Handling stains are reduced from 5.18% to 1.92%
- Overall rejection is reduced from 1.39% to 0.57%. End-product quality is increased which intern increase customer satisfaction

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