REDUCTION OF FABRIC CONSUMPTION, BY INCREASING FABRIC UTILIZATION & MINIMIZING WASTAGE IN GARMENT SECTOR

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ABSTRACT: Readymade garments sector being one of the engines for growth in textile sector, quality and productivity plays a vital role in economic development of the country. This report represents a detail investigation on "reducing fabric wastage by increasing fabric utilization" of a garment factory by applying Industrial Engineering techniques. The aim of this study is to minimize wastage that will improve fabric utilization. This work provides the guidelines for the betterment and control of wastes in garment industry for spreading and cutting by using novel methods.

CHAPTER 1

1. INTRODUCTION

The change seen in global condition is rapid, generally in an industry focus is given on profit margin and improved productivity. In garment manufacturing, it is usual few of fabrics and trims are leftovers after shipment. The manufacturer usually orders excessive raw material to meet the orders.

However, factory must have check points to control this issue. There is no ready-made solution that can reduce leftover percentage overnight. Each order is not unique. To improve the growth of garment firms in positive direction, it is important to ensure the proper utilization of each resource of firms.

In many garment manufacturing firms, the growth mainly depends on minimization of garment waste to achieve maximum benefits by proper utilization of raw materials like fabrics and trims.

A leftover normally comes from excess materials in the bulk. Excess percentage is considering the following factors,

i. Cut wastage
ii. Shrinkage
iii. Pre Production Yardage
iv. Fabric Performance Test
v. Blanket dyeing
vi. Extra cut percentage
vii. Garment rejection

In the modern world of garment manufacturing, different firms have initiated to adopt inventory tools and techniques and practices to minimize the percentage of wastage and defects. Waste and productivity of firms are the two main issues of garments in worldwide. In this connection this study work has been conducted in garment manufacturing firms.

This study concentrates for implementation of inventory management in particular department, to reduce the end bits and improving 5S concept in working areas for reduction of wastage.

2. OBJECTIVES

The main objectives of this project work are given below.

- To study on current production process
- To identify the methods to reduce fabric wastage
- To implement the methods identified
- To analyze the final results

3. METHODOLOGY

3.1 MATERIALS AND METHODS

In the apparel manufacturing industry, main raw material is fabric; others are different types of trimming and accessories. Fabric wastage in apparel manufacturing process are to order the excessive fabric and end loss in cutting department. To achieve the overall objective in minimizing wastages it is needed to establish document and maintain a system capable of ensuring that products conform in total to standard specifications. This will be required at lower level of working areas. Finally, the last segment is to compare theoretical and mathematical evaluation about the existing and proposed waste and defect control system for improving fabric utilization. The general methodology followed in Fig 4.1,

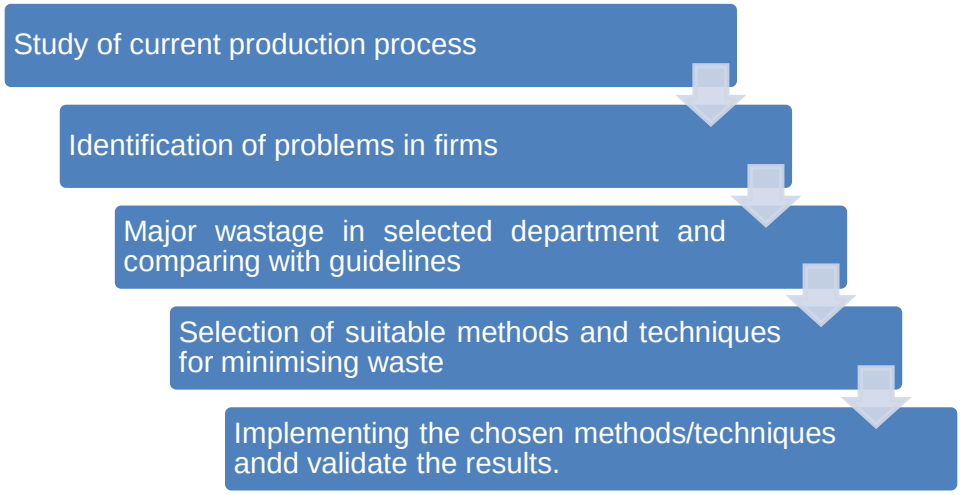

Fig. 4.1 Methodology

The waste minimization study was conducted at Shahi Exports Pvt. Ltd., Bangalore. Two months data was collected and major defects, repetitive waste were identified. By the use of Cause & effect diagram, there was analyzed and alternative ideas were worked into towards reducing waste. The work flow is depicted in Fig 4.2.

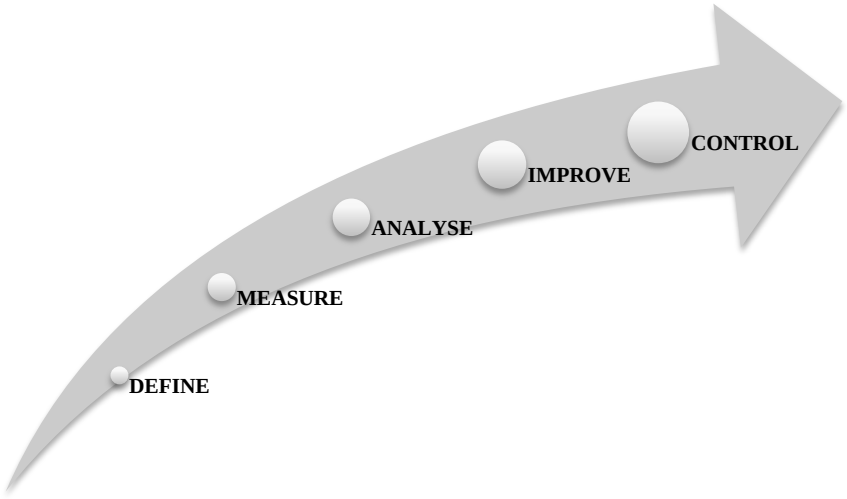

Fig. 4.2 Approach of work

4. RESULT AND DISCUSSION

This chapter discusses the wastage areas and its various causes by root cause analysis with suitable solutions to reduce wastage at each process. It uses statistical process control tools and auditing reports to minimize the wastage in cutting process.

4.1 EFFECT OF MARKER TYPES ON MARKER EFFICIENCY

4.1.1 Marker Efficiency

The fabric utilization is based on the marker efficiency and method of laying the fabric. Marker efficiency is defined as a ratio of area of marker used in a garment and area of total marker.

Marker efficiency% = (Area of marker used for garments / Area of total marker)*100

The marker that has been already followed in industries is easiness marker (Figure 5.2). Utilization of fabric is not achieved much by following this marker. Hence this results in fabric wastage too. Hence there is a need to follow any of the below given methods in order to improve the fabric utilization.

i. Marker made without easiness
ii. Low buffer marker
iii. Pin table marker

4.1.1.1 Easiness marker

Marker made by placing both cuffs and pocket next to front panel for achieving exact matching, also making easy in cutting and sewing.

Fig.5.1. Cuffs and pocket placement

Figure 5.2 shows the easiness marker of checked fabric pattern. By following this marker, the consumption 1.76 m and the efficiency achieved is 71.8%.

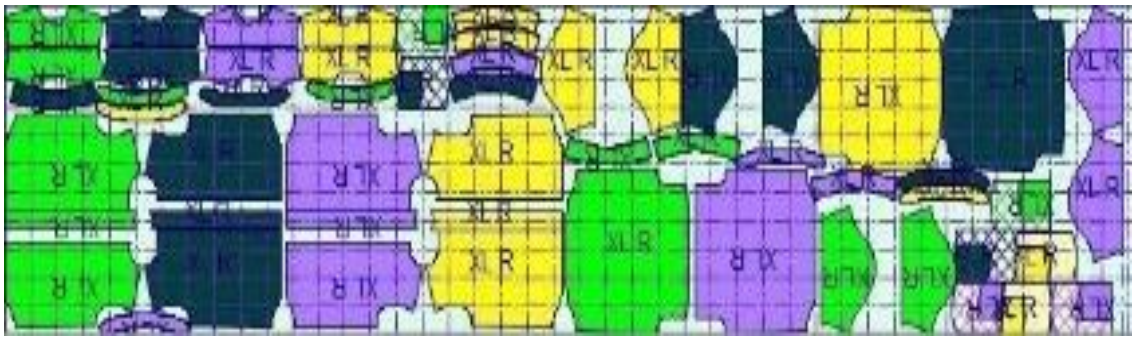

Fig.5.2 Easiness marker

4.1.1.2 Marker made without easiness

Marker made without easiness improves the fabric consumption and increase the marker efficiency. Figure 5.3 shows the marker made without easiness. By changing the pattern placement areas from easiness marker. By following this marker, the consumption 1.66 m and the efficiency achieved is 76%.

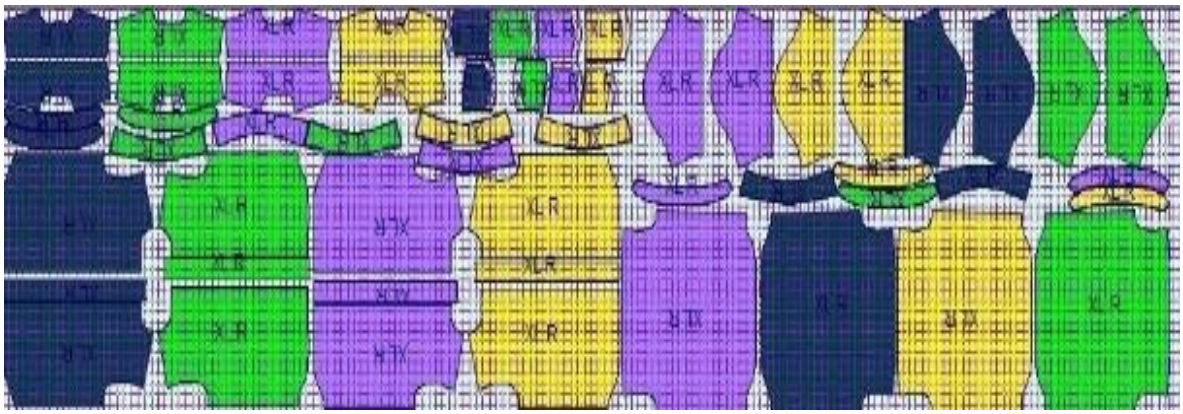

Fig.5.3. Marker without easiness

4.1.1.3 Low buffer marker

Normally industries follows 12mm buffer between the markers. So fabric consumption and efficiency is poor. Figure 5.4 shows the 10mm buffer between the marker pattern. By following this marker, the consumption 1.71 m and the efficiency achieved is 73.8%.

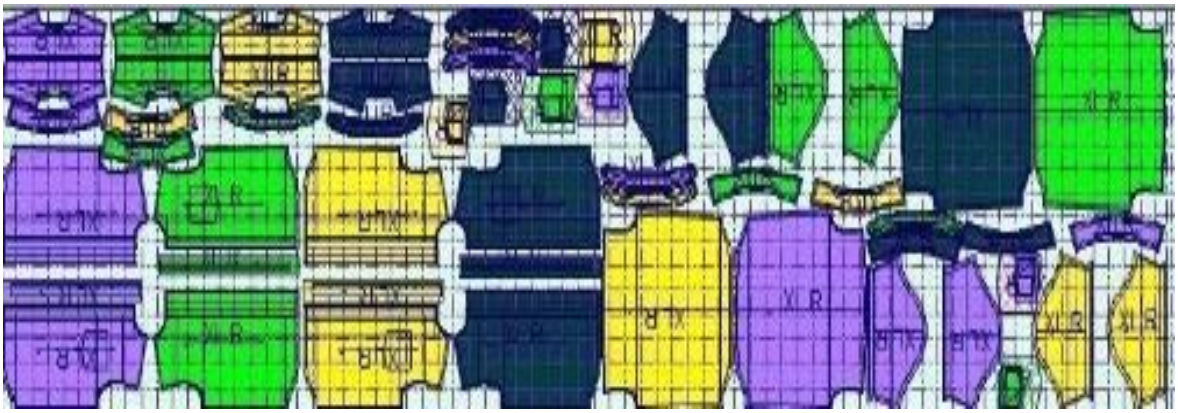

Fig.5.4. Low buffer marker

Comparison between various markers for woven shirts, and marker efficiency of the above given three different markers are shown in table 5.1, figure 5.5.

Table 5.1 Comparison between various markers for woven shirts

Details	Style	No of Parts per lay	Marker Consumption (m)	Efficiency %
s	103005	56	1.76	71.42
Marker Made Without Easiness	103005	56	1.66	75.08
Low Buffer Marker	103005	56	1.71	73.06

Table 5.2 Efficiency (%) of various marker

serial No	Easiness marker	Marker made without easiness	Low buffer marker
1	71.8	76	73.8
2	70.4	74	73.2
3	71.2	70	73.8
4	70	76	73
5	71.8	75.8	72.8

Results on various marker efficiency (%) and ANOVA table for various marker efficiency (%) are shows on table 5.3 and table 5.4.

Table 5.3 Results on various marker efficiency (%)

SUMMARY				
Groups	Count	Sum	Average	Variance
Easiness marker	5	355.2	71.04	0.668
Marker made without easiness	5	371.8	74.36	6.648
Low buffer marker	5	366.6	73.32	0.212

Table 5.4 ANOVA table for various marker efficiency (%)

ANOVA						
Source of Variation	Sum of squares	Degree of freedom	Mean square	F value	P-value	F crit
Between Groups	28.83733333	2	14.41867	5.746015	0.017765	3.885294
Within Groups	30.112	12	2.509333			
Total	58.94933333	14				

There is a significant difference between the different type of markers, since p value is 0.017, which is less than 0.05.

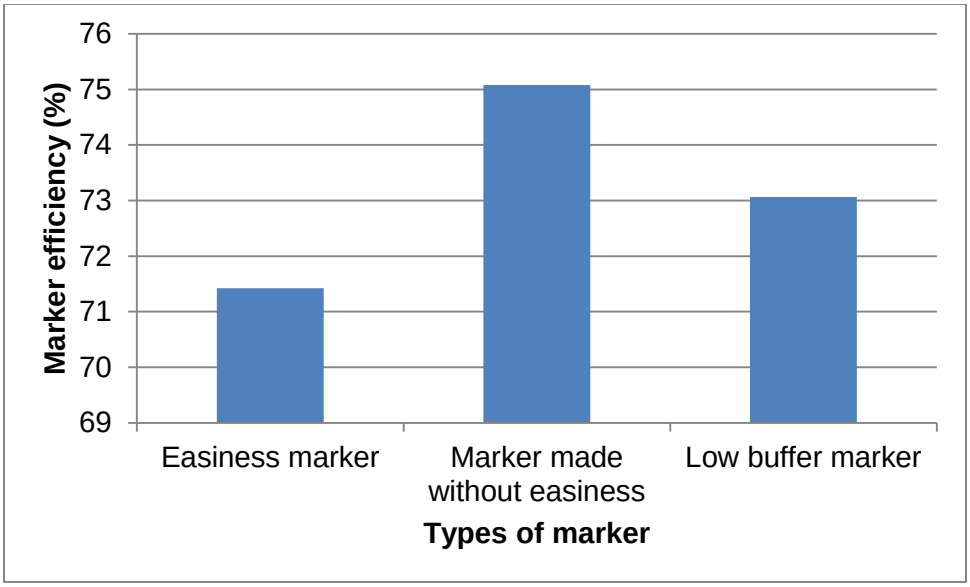

Fig.5.5. Marker Efficiency for Various Markers

4.1.2 Fabric Laying

Causes are usually grouped into major categories to identify these sources of variation. Figure 5.6 shows the typical diagram for understanding the fabric laying from the point of view and all 4M's like Man, Machine, Method and Material are the parameters.

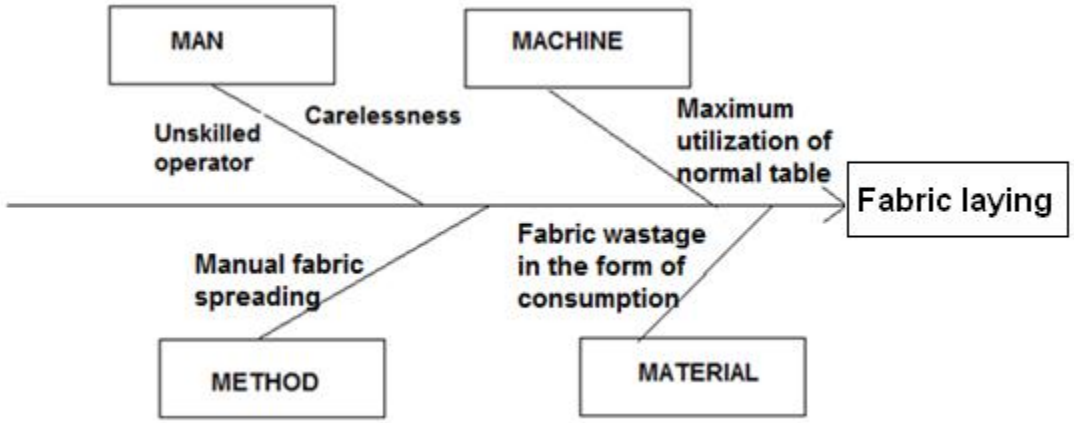

Fig.5.6 Cause-Effect diagram for fabric laying

4.1.2.1 Pin table marker

Most of the industries preferred the normal table for fabric spreading. There is no technical problems happens in laying solid fabric. But laying checked and striped fabrics will lead to technical problems like bowing and skewing, so relaying is must to match checks and stripes with the panels.

The pin table may be used for,

- Matching of checks and stripes in the garment production has always been difficult and time consuming.
- Traditional methods tend to waste a lot of material, since the patterns are cut with blocking tolerances.
- When the fabric costs represent 60-70% of the total costs.
- The task of rearranging the blocked pieces is tedious and expensive.
- The workers involved in this process have to be skilled.

The following figure 5.7 and figure 5.8 shows the skewing and bowing on the fabric.

Fig.5.7. Skewing on fabric

Fig.5.8. Bowing on fabric

Pin table is suitable for checked fabric with all types of weaving. By following this figure 5.9 shows the pin table marker, the consumption achieved 1.62 m.

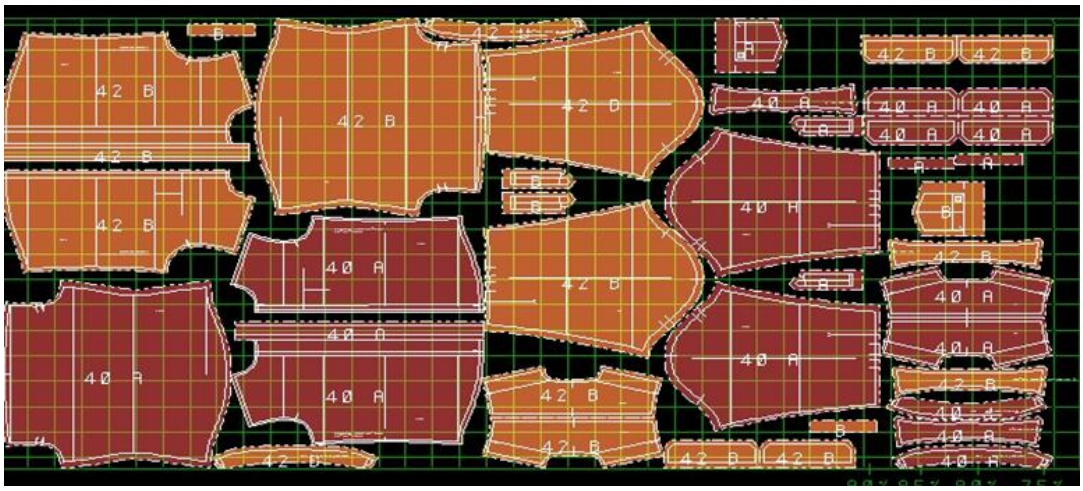

Fig.5.9. Pin table marker

When using the normal table for check fabric laying, there may be a chances to get the defects like a bowing and skewing. In order to avoid these defects we can use the pin table for check fabric laying. It can save the fabric consumption up to 0.05%.The following table 5.5 shows the difference between the normal and pin table consumption per garment.

Table 5.5 Difference between the normal and pin table consumption

Garment Quantity	Pin table Consumption per Garment (m)	Normal table Consumption per Garment	Savings in meter
4000	1.30	1.34	0.04
3000	1.62	1.67	0.07
2000	1.72	1.76	0.04
1000	1.72	1.76	0.04
700	1.62	1.67	0.07
100	1.72	1.76	0.04

Figure 5.10 shows consumption of fabric when pintable and normal table is used. This shows that fabric can be saved when pin table is followed.

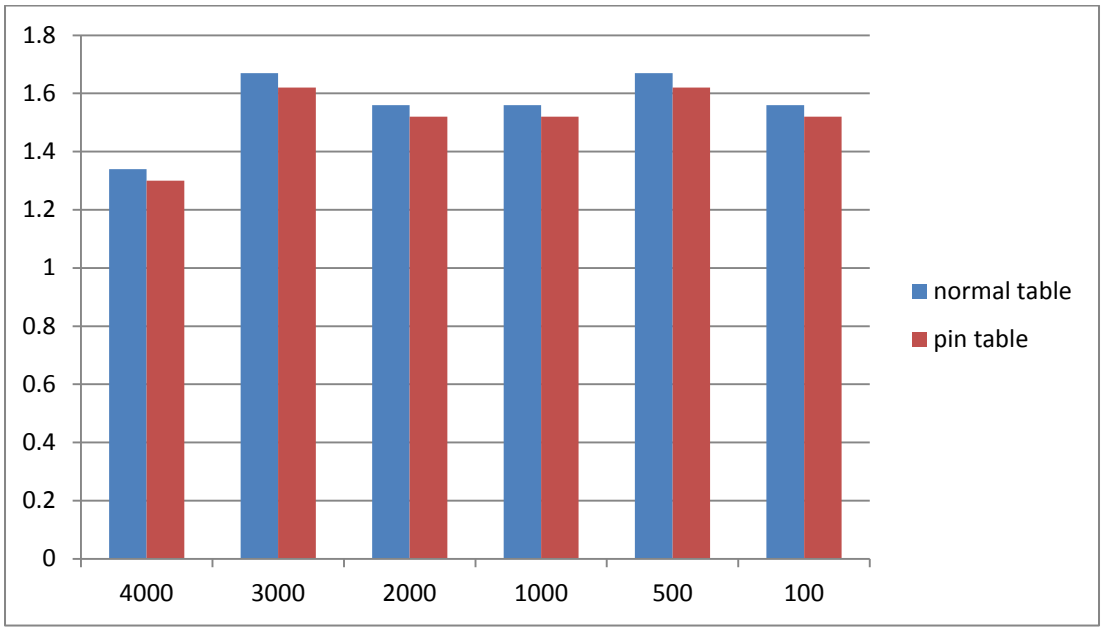

Fig.5.10. Normal and pin table consumption

By using the pin table, Reduce fabric consumption, improves quality, spreading and matching at the same time, save relaying operations, quick setup time are achieved.

4.2 EFFECT OF FABRIC WASTAGE ON SPREADING

i. Ends of ply losses

ii. Ends of piece losses

iii. Edge losses

iv. Splicing losses

Are the different fabric spreading losses faced in the garment industries. Ends of ply losses are the one that occupies the larger part than others as shows in the figure 5.11. Hence this problem has been taken into account to reduce the fabric wastage.

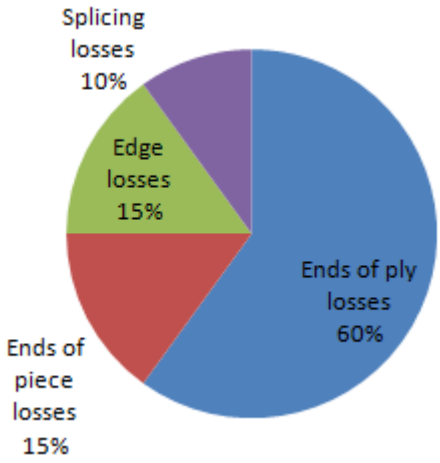

Fig.5.11. Fabric spreading losses

End of ply loss: Uneven slitting of fabric on every ply by a laying employee, resulting in excess wastage.

4.2.1 Influence of Man, Method and Material (3M's) on End of Ply Loss

Causes are usually grouped into major categories to identify these sources of variation. Figure 5.12 shows the typical diagram for understanding the end of ply loss from the point of view and all 3M's like Man, Method and Material are the parameters.

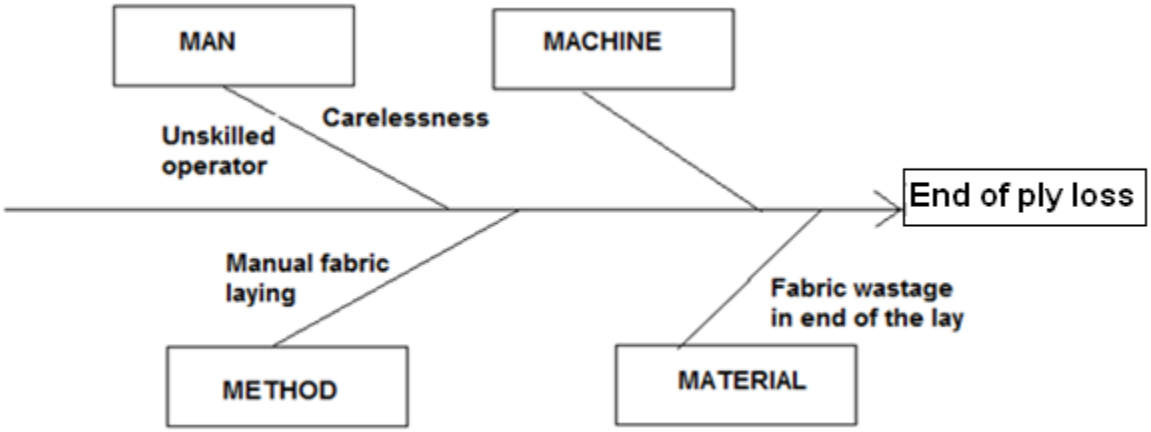

Fig.5.12. Cause-Effect diagram for End of ply loss

In order overcome these issues, thee lay stopper can be used which provides the reduction of fabric loss while cutting.

4.2.2 Lay End Stopper Provided For Spreading

The lay is spread manually, when it done manually there will be improper alignment of plies in the end of the lay. When many plies are placed in the same lay it forms improper arrangements, it causes more wastages. This improper arrangement can be rectified by keeping the lay end stopper, we will get same proper aligned lay.

The following figure 5.13 shows the end of ply loss during the spreading.

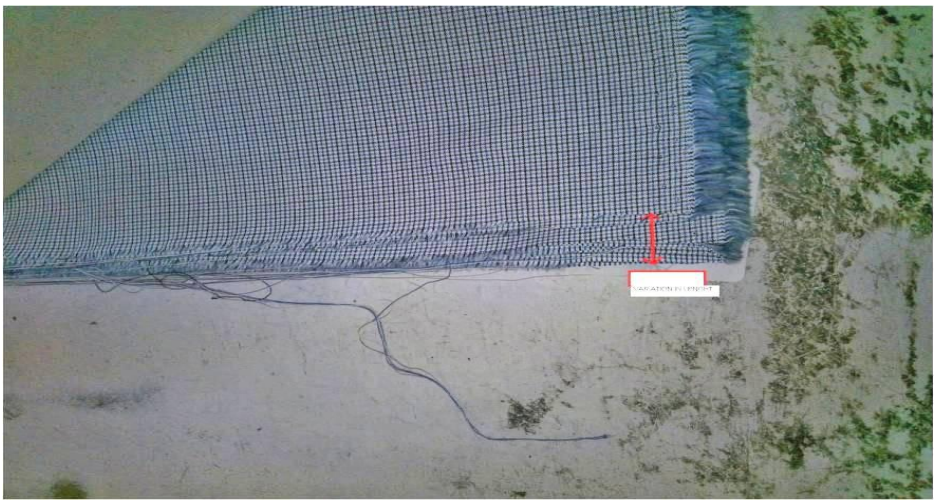

Fig.5.13. End of ply loss

By using the lay stopper, fabric evenness, uniformity and reduction in wastage are achieved (Figure 5.14 and 5.15).

Fig.5.14. Lay end stopper provided

Fig.5.15. Fabric uniformity after spreading

4.3 EFFECT OF SEWING DEPARTMENT

The repetitive defects which are cause major problem on garment. Sometimes this leads to give garment rejection in inspection. In these defects are influenced up to 2% on excess of bulk material. Those defects are identified and also solutions are given below,

4.3.1 Measurement Out of Tolerance

Causes are usually grouped into major categories to identify these sources of variation. Figure 5.16 shows the typical diagram for understanding the measurement out of tolerance from the point of view and all 4M's like Man, Machine, Method and Material are the parameters.

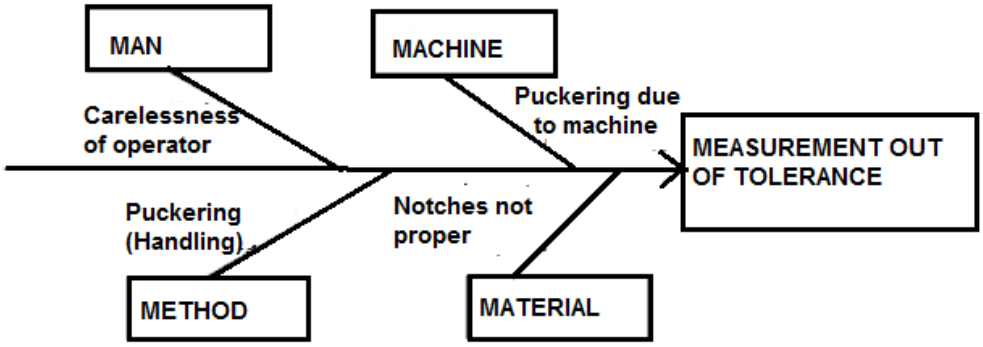

Fig. 5.16 Cause-Effect diagram for Measurement of tolerance

Measurement out of tolerance is caused due to improper notches in pleats. It can be rectified in cutting department by informing them about the misalignment of notches and it checked before it sending to the sewing department. Bundles are checked 100% before sending to sewing.

4.3.2 Puckering At Waistband

Figure 5.17 shows the typical diagram for understanding the puckering at waistband from the point of view and all 4M's like Man, Machine, Method and Material are the parameters.

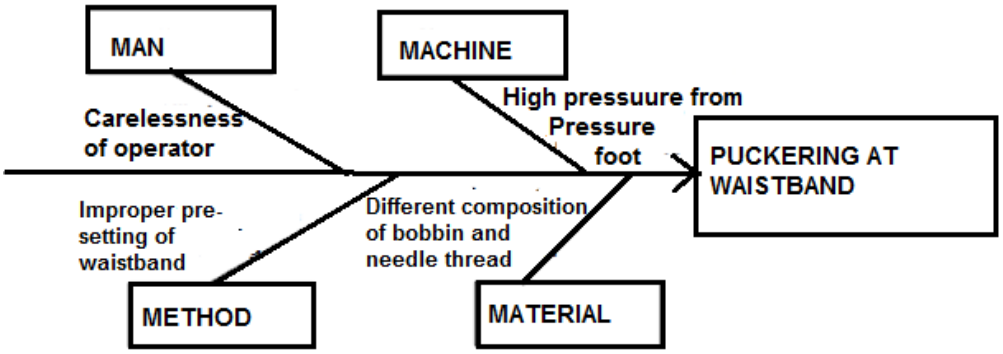

Fig. 5.17 Cause-Effect diagram for Puckering at waistband

Puckering at waistband is caused due to much tension, thereby causing a stitch in the thread. After sewing, the thread relaxes. As if attempts to recover its original length, it gathers up the seam, causing the pucker.

4.3.3 Roping

Figure 5.18 shows the typical diagram for understanding the roping from the point of view and all 4M's like Man, Machine, Method and Material are the parameters.

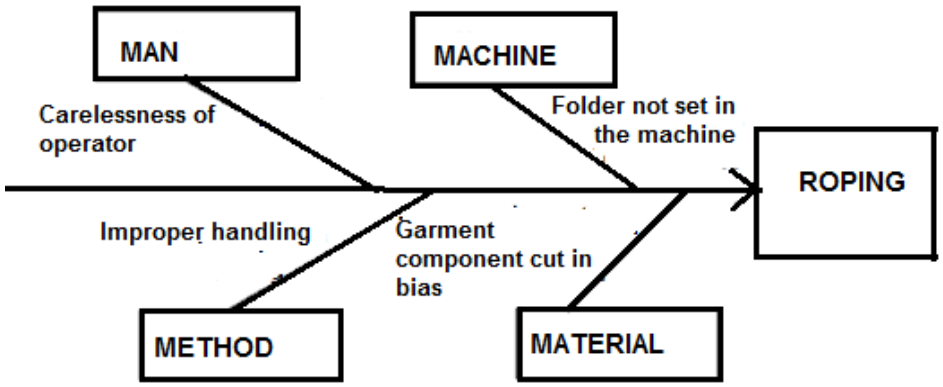

Fig. 5.18 Cause-Effect diagram for Roping

Roping is caused due to high tension in folders and threads, it is same as puckering. It causes shrinkage after stitching. Thread is been stitched and after some time it recovers to the original position. When the folder is so tight it forms shrinkage, it can be rectified by adjusting the alignment of folders.

4.3.4 Waistband Extension Uneven

Figure 5.19 shows the typical diagram for understanding the waistband extension uneven from the point of view and all 4M's like Man, Machine, Method and Material are the parameters.

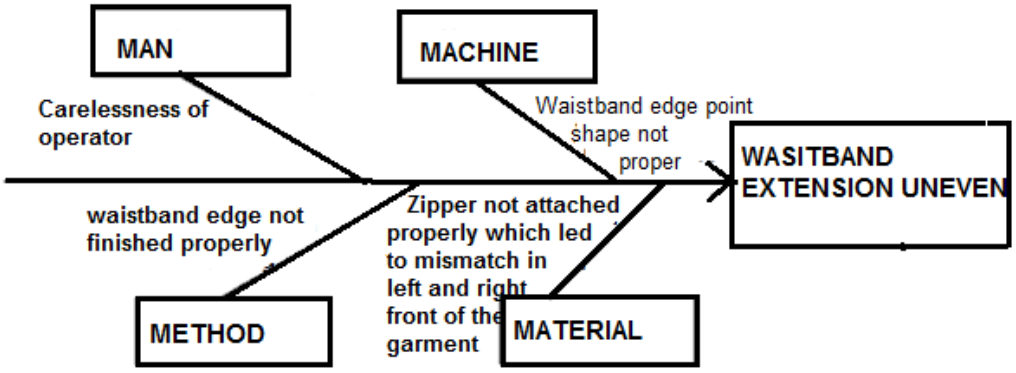

Fig. 5.19 Cause-Effect diagram for Waistband extension uneven

Waistband extension is improper attachment while stitching. Waistband is placed unevenly in the edges, it cause extension of waistband. This can be rectified by practicing the tailors with proper instruction.

4.3.5 Improper Fly Stitch

Figure 5.20 shows the typical diagram for understanding the improper fly stitch from the point of view and all 4M's like Man, Machine, Method and Material are the parameters.

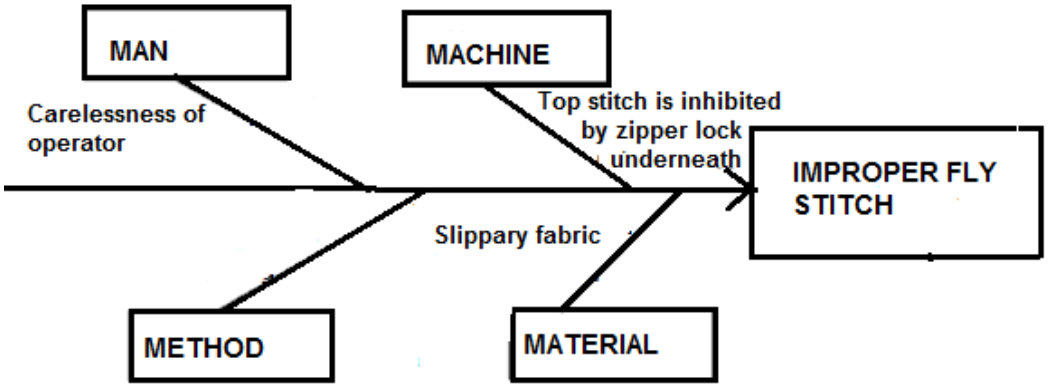

Fig. 5.20 Cause-Effect diagram for Improper fly shape

Improper fly shape is occurs due to improper placement of fly and unshaped. Templates can be used for fly attachment to avoid unshaped in fly.

CONCLUSIONS

The selection was based on the previous month data report. Initially the sequence of operation, man power requirement, types of spreading, order quantity in each control sheet, marker efficiency is collected. After understanding the basic details, project was initiated in a particular areas for achieving reduce wastage, by collecting previous month data and auditing data for study.

It was found that up to maximum wastage can be reduced by concentrating majorly on 2 areas. The first objective the project was identified the wastage position in which maximum wastage occurs and second objective was to analyze the wastage through cause and effect diagram. The hierarchy of each defects and wastage was organized and the causes for these wastages are shown individually using cause and effect diagram and appropriate remedies and suggestions are given for the concerned areas.

The effective use of the management techniques, suggestion and statistical process control leads the following results such as,

- Effectively minimized wastage
- Productivity and their corresponding efficiency increased while the rejection rate was reduced.

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