

EFFICIENCY IMPROVEMENT OF A GARMENT INDUSTRY USING WORK STUDY TECHNIQUES

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Abstract

Lean manufacturing is a performance-based process used in manufacturing organizations to increase competitive advantage. The existing garment manufacturing process, especially in the production-prepacking stage, is experiencing delays affecting the delivery rates. The main objective of the project is to improve the efficiency of the production lines and packing unit. This study aims to analyze the existing garment manufacturing process at LT Karle Production Unit 1, Bangalore and implement lean management system on the manufacturing process, thereby improving the efficiency. This will involve implementation of lean tools such as 5S, the 7QC tools etc. The proposed new workplace layout and techniques were found to be effective and reduced the cycle time of the waist band section resulting in an improved efficiency of line 4.

Key words: Lean Manufacturing, 5S, 7QC Tools,

1. INTRODUCTION

Lean is an optimized manufacturing approach that aims to streamline the flow within an organization. Lean manufacturing caught the eye of the world due to Toyota's steady growth from a small company to one of the biggest automobile manufacturer in the world. Today manufacturing industries and also companies in the service sector are increasingly adopting and modifying lean strategies and practices to suit their needs and streamlining their processes. Lean manufacturing has thus become a necessary tool to remain competitive in the market.

The lean manufacturing concept in the apparel industry can reduce the operational cost in manufacturing by eliminating the process waste empowering people with greater communication increasing the higher productivity in the execution process and turning the organization into a learning organization.

There are two types of products made in any garment industry that is continuous products and seasonal products. Continuous products are those, which are made, are year along and season products are those, which are made for a particular season, that is, summer, winter, for different festival seasons etc.

With increase in competition and companies wooing the customer, agile supply chain has become the new mantra. Those who can get the product on shelf when the customer wanted it could sell more.

2. EXPERIMENTAL BACKGROUND

2.1 Production Data

The production data for the 11 sewing lines were collected and were tabulated. Average production data is shown in the table 2.1. Fig. 2.1 below shows the quantity of clothes produced across a span of 8 days for the 11 sewing lines in the sewing section. The total output of each day and the average quantity produced per line is depicted and tabulated as shown.

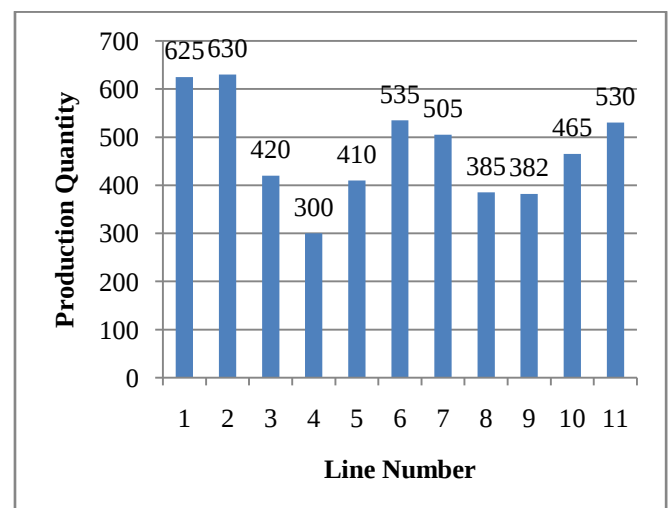


Fig. 2.1 Average Production Data

On analysis of the above graph it was observed that the sewing line number 4 was subpar in production when compared to the other lines. Hence a detailed study of the line was done and the current status of the line is as follows:

2.2 Time Study of Line 4

Table 2.1 Time Study of the 3 Sections in minutes

Front Panel	Back Panel	Waist Panel	Front Panel	Back Panel	Waist Panel
10.23	10.25	12.4	10	9.3	13.1
11.12	10.2	13.2	10.45	10	13.45
10.19	11.1	13.25	10.1	11.2	13.2
11	10.5	13	10.2	10.15	14.2
9.35	10.08	13.18	9.33	9.5	13.05
9.55	10.18	12.5	9.4	10.05	12.55
10.32	9.35	12.45	11.15	11	13.55
10.05	9.42	13.3	11	10.45	12.55
10.48	11.2	13.35	10.25	10.08	13.12
11.32	11.05	13.5	10.12	9.45	12.4
10.34	10.24	14.1	9.5	9.54	13.15
9.41	10.1	13.3	9.46	10.35	13.52
9.4	9.55	13.2	10.15	10	13.34
10.55	9.48	12.3	10.5	10.5	14.13
10.56	10.15	12.58	10.1	11.3	14.05
9.4	10.5	12.42	10.03	10.3	13.35
10.1	10.1	13.2	10.1	9.4	14
10.42	10	13.5	10.4	9.42	13.25
11.04	10.09	13.42	10.3	10.55	13.18
10	10.45	14.1	9.42	10.56	12.46
9.48	10.3	14.25	9.55	9.38	13
10.15	9.4	13.4	9.3	11	13.1
10.22	9.55	13.3			

The time taken for the front panel, back panel and waist panel sections for a batch size of 10 was collected and tabulated as shown above. It was found that the average times taken for the front, back and waist panels were 10.2, 10.2, 13.3 minutes respectively

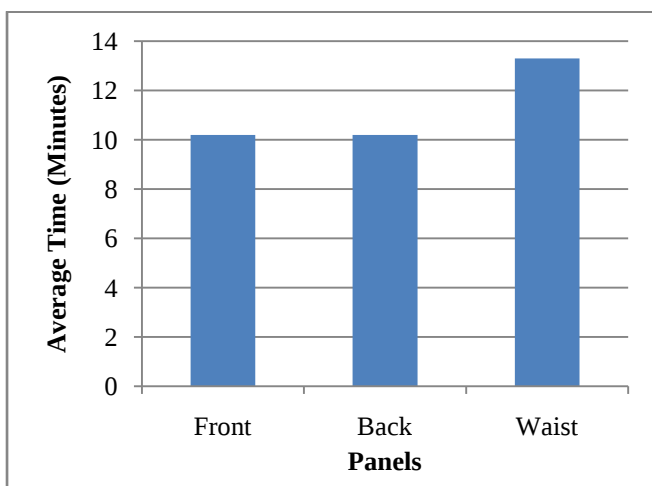


Fig. 2.2 Graph Depicting Average Time Taken in Minutes

From the graph it was observed that due to more time needed for the production of the waist panel there was an imbalance which caused the other two parts to wait at the assembly section. Hence further analysis was needed in order to balance the waist loop section.

The arrival rate of material from the cutting section = 60 pieces/hr

Production rate of line 4=45 pieces/hr

Line Efficiency=75%

Production rate for front panel=58 pieces/hr. Production rate for back panel=58 pieces/hr. Production rate for waist panel=45 pieces/hr.

Due to delay in the operations in the waist band section the productivity of the line is low. Hence in order to increase production rate a detailed time study of the waist band section was taken and analyzed.

It was observed that operations 1, 3, 5 and 9 were taking relatively more time and efforts were made to reduce these times.

2.3 Two Handed Process Charts

Two handed process charts were drawn for the different operations present in the waist band section and the improvements made for certain operations as can be seen from the charts displayed.

Table 2.2 Summary of Two-Handed Process Chart for Operation 1 (Existing and Improved)

Summary		
	LH	RH
Operations	8	6
Transportations	5	-
Delays	1	2
Storage	4	10
Total	18	18

Summary		
	LH	RH
Operations	8	9
Transportations	1	5
Delays	2	-
Storage	3	-
Total	14	14

The change in layout helped the operator to reduce steps from 18 to 14 as can be seen and brought about a balance of load on both hands enabling better performance.

Table 2.3 Summary of Two-Handed Process Chart for Operation 3 (Existing and Improved)

Summary		
	LH	RH
Operations	5	6
Transportations	5	2
Delays	1	7
Storage	4	-
Total	15	15

Summary		
	LH	RH
Operations	6	5
Transportations	3	4
Delays	2	1
Storage	1	2
Total	13	13

The new layout helped the operator to reduce the time taken to search for the strips in the mixed box and lead to overall improvement in his performance. The operator could perform his task faster with the new workplace arrangement and helped attain symmetry of motions.

Table 2.4 Summary of Two-Handed Process Chart for Operation 5 (Existing and Improved)

Summary		
	LH	RH
Operations	6	5
Transportations	3	4
Delays	2	1
Storage	1	2
Total	13	12

Summary		
	LH	RH
Operations	6	5
Transportations	3	2
Delays	1	2
Storage	1	2
Total	11	11

The improved layout led to reduction of process steps enabling better performance.

Table 2.5 Summary of Two-Handed Process Chart for Operation 9 (Existing and Improved)

Summary		
	LH	RH
Operations	8	4
Transportations	6	4
Delays	1	7
Storage	-	-
Total	15	15

Summary		
	LH	RH
Operations	6	5
Transportations	5	4
Delays	1	4
Storage	1	0
Total	13	11

The improved layout led to reduction of process steps enabling better performance.

3. RESULTS AND DISCUSSIONS

3.1 Two Handed Process Chart

Two handed process charts were drawn for the above waist band operations and it was noticed that in operations 1,3,5 and 9 the principles of motion economy were violated and there was a lack of symmetry.

New layouts were implemented for operations 1 and 3 improving workspace utilization.

Overall with the help of the new two handed process charts and the new layouts 10 steps were reduced leading to a time saving of 1.4 minutes for every batch of 10. This in turn helped to reduce the average time taken for the waist band section from 13.3 minutes to 11.5 minutes for a batch of 10.

Table 3.1 New Times For Waist Panel in Minutes (Batch Size:10)

Time (Minutes)	Time (Minutes)
11.2	11.45
11.4	11.59
11.15	12.3
11.4	11.5
11.52	12.5
11.58	11.23
11.2	11.45
11.4	11.05
12.34	11.29
11.5	11.16
Average Time = 11.51 minutes	

This time saving has helped increase the production from 45 pieces to 52 pieces per hour thereby improving the line efficiency from 75% to 86%.

Due to an increase in production by 56 pieces per day, this lead to an increase in revenue for the company by 2240 \$ per day.

3.2 5S

3.2.1 Current Status

Table 3.2 shows the combined status of each department at Karle International. These were the generic problems that were found out requiring 5s action as indicated.

Table 3.2 Current status of each department

Problem	Cutting	Stitching	Finishing	Packing	Action Required
Unnecessary Items	No	Yes	Yes	Yes	Sorting
Leftover Percent	Yes	Yes	Yes	Yes	Sorting
Rejection on Floor	Yes	Yes	No	Yes	Sorting
Floor Marking			No	No	Set in Order
Labels	No	No	No	No	Set in Order
Racks and Bins	No	No	No	Yes	Set in Order
Dust and Stains	Yes	Yes	Yes	Yes	Shine

Production line was cleaned and labeled and floor markings were redone to facilitate proper material movement. Leftovers and rejections were cleared out and raw material was stacked in proper manner.

3.2.2 Shine Table and Material Handling box

A shine table was made in order keep the workplace healthy and clean as a healthy environment leads to better work performance and boosts worker morale. Responsibility was assigned to concerned person to maintain cleanliness at the workplace.

A segregation box with compartments was designed in order to facilitate easier sorting of clothes of different sizes. This helped to improve packing efficiency as there was no time needed to sort the garments coming in from the pre-packaging section.

5S implementation has lead to better organization and helped increase the overall healthiness of the facility.

The current and the improved scenario have been depicted as shown in the above pictures.

The new segregation box for sorting of garments in the pre packing section has helped improve the speed of packing leading to increase in efficiency from 86% to 90% in the packaging section and also reducing a labor leading to cost benefits. Reduced labor helped save the company a cost of 1.2 lakhs as wages.

4. CONCLUSION

4.1 Two Handed Process Chart

It was observed that for operations 1, 3, 5 and 9 in the waist loop section there was no balance of work on both hands and there was a lack of symmetry.

Also improper workplace arrangement for operations 1 and 3 was leading to more time consumption.

By the proposed new layouts and two handed process charts for the operations, symmetry was established and violations of principles of motion economy were avoided.

The proposed new workplace layout and techniques were found to be effective and reduced the cycle time of the waist band section from 13.3 minutes to 11.5 minutes resulting in an improved efficiency of line 4.

4.2 5S

It was observed that certain areas in the facility required 5s. Implementation of the 5s technique helped to improve the overall healthiness of the facility in turn leading to better performance.

Also a segregation box was proposed in the pre packaging section to sort the garments leading to time saving in the packing section improving packing efficiency and reducing a labor for segregation purpose leading to cost saving.

5. RECOMMENDATIONS

Once the new layouts and methods were developed and the results drawn and the recommendations were made.

The initial recommendation that was made to the company was that to conduct time study of the other sewing lines as well and try eliminating the bottlenecks sections consuming more time.

It was also recommended that the company to sort out the garments produced in the pre--- packaging section so that time is saved for packaging and can be done in a more efficient manner.

Also if possible it was recommended to increase a line in the pre packaging section to meet the demand of outputs produced from the 11 sewing lines compared to only 5 in the pre packaging section.

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