Implementation of Lean Manufacturing In Textile Industry

By Shanthi Rangasamy*

Lean manufacturing, also called lean production, is a set of tools and methodologies that aims for the continuous elimination of all waste in the production process. The main benefits of this are lower production costs; increased output and shorter production lead times. In order to cope with increasing competitive intensity, manufacturing companies attempt to improve their manufacturing operations by addressing specific needs.

Objectives

- To study about the existing production systems in garment industry and suggest to implement the lean manufacturing systems.
- To study the existing problems in the present production method.
- To identify and minimize the wastage in production.
- To reduce the lead time, inventory work force and space required.
- This study will give information regarding supporting production tools like time study, motion study, operators training etc.,

Research Methodology

Descri-ptive and experimental research method is adopted for this study. The company under study is Aksath garments in Tirupur of Coimbatore city. The data is based on the existing production system prevailing in the Aksath garments by examining the current production process by direct observation and direct interview. 100 employees who belong to upper, lower and middle level management of the company were interviewed with a set of questions to know about the prevailing production system. Period of study was 5 months from November 2013 to February 2014.The tools applied in this study are Seven Wastes, JIT (Just in Time) and Seven QC tools.

> The lean manufacturing system is the technical production system. This system is mostly followed in the automobile industry. This research is the experiment for implementing the lean manufacturing system in the garment industry. The company should improve the productivity, profit, utilization of resource and quality of the products. Lean manufacturing tools are simple methods to implement in the industry and it doesn't cost much for implementation.

Data Analysis & Interpretation: The techniques adopted in this study are Seven Wastes, JIT (Just in Time) and Seven QC tools. Now let us see all the tools applied one by one.

Seven Wastes

a. Over-Production: Table-1 shows Demand, Over Production & Optimum Production from July to November.

b. Defects: Table-2 shows Defects of basis polo T-shirt for 10 days (Before After and Implementation)

c. Inventory: Table-3 shows Inventory (Before Implementation and After Implementation)

d. Transportation: Table-4 shows Transportation lead time in line & batch Production

e. Waiting: Table-5 shows Waiting of the product in Batch Production system: (Checking Department)

f. Correction: Table-6 shows Correction of the product (Before &After Implementation of lean)

g. Under utilization of human resource: Table-7 shows under utilization of Human Resource

Just In Time (JIT): Table-9 shows JIT purchasing.

Seven Tools of Quality

a. Cause and effect diagram: Figure 1 shows the cause and effect diagram for the defect of seam puckering.

b. Check sheet: Table-10: Shows the check sheet for the final inspection of basic polo T-Shirt.

c. Control chart: Chart 1 and Table-8 shows the variation in the defects which reduces the quality of the product. The maximum defects

* Mrs. Shantha Rangasamy, Assistant Professor & Head, Sasurie Academy of Engineering, Kariayampalayam, Coimbatore.

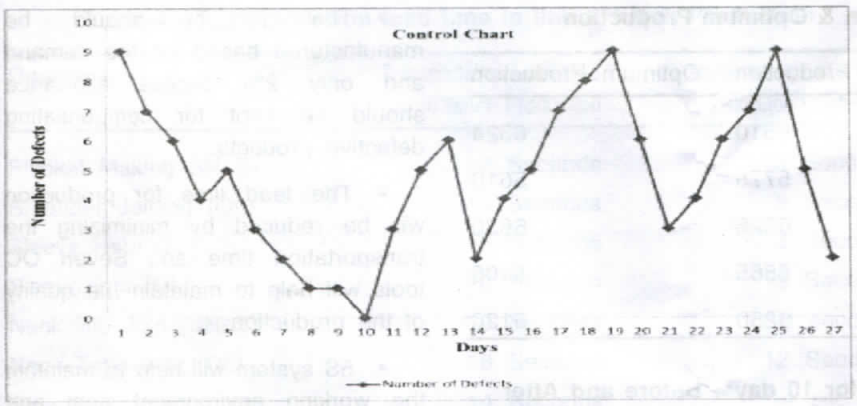

Chart 1: Quality Control

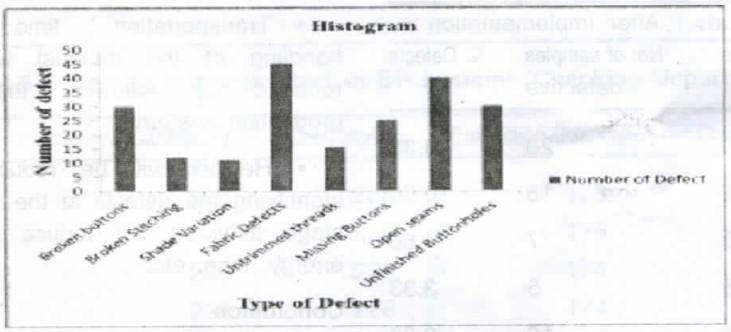

Chart 2 : Type & Number of defects

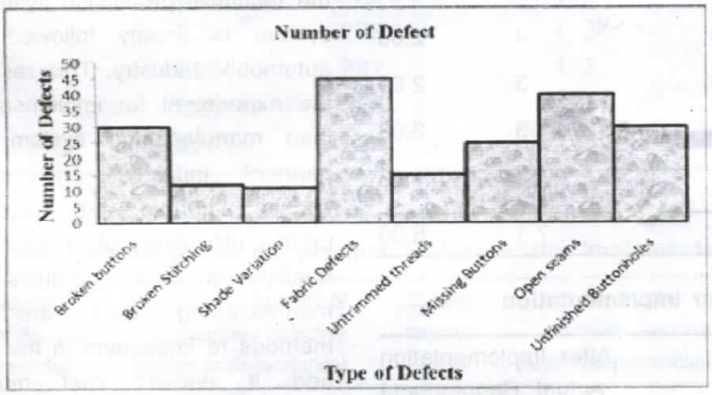

Chart 3: Pareto chart

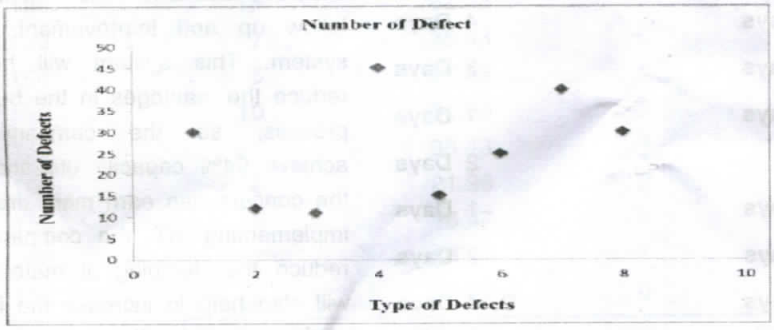

Chart 4: Scatter diagram

(9) that occurred 3 times in 27 days within the sample of 4050.

d. Histogram: Chart 2 **Shows** the histogram for the Table-10.

e. Pareto chart: Chart 3 **Shows** the pareto chart for the Table-10.

f. Scatter diagram: Chart 4 **Shows** the scatter diagram for the Table-10.

Findings: The company allows 5% excess production for compensating the defects in final stage. And it will reduce to 2 % after implementation of lean system.

- The defects are reduced from 5.06 to 2.53, after the implementation of the lean manufacturing system.
- Inventory is stored for 10 days before requirement. It will reduce to 5 days by implementing JIT system.
- The company is following Batch Production system of production. It leads to higher transportation time (2.41) minutes than the Line production system (1.40) minutes. In Line production system all process is done immediately. But in Batch Production system. The finished product can get at the end of the day. So checking is done in next day.
- The correction times are lower from 417.24 to 161.12 minutes by implementing quality systems.
- The company is not following quality control tools and the workers had confusion in step by step process in production.
- The capacity of production is 3200 pieces per unit in one month. But the company utilizes only 73.4% of capacity.

Suggestions

- JIT inventory system should be followed to avoid storing of inventory for long time.

Table-1 – Demand, Over Production & Optimum Production

Month	Demand	Over Production	Optimum Production
July	6200	6510	6324
August	5500	5775	5610
September	6500	6825	6630
October	5300	5565	5406
November	6000	6250	6120

Table-2 – Defects of basis polo T-shirt for 10 days: Before and After Implementation

S.No	No. of samples inspected	Before Implementation		After Implementation	
		No. of samples defective	% Defects	No. of samples defective	% Defects
1	150	9	6.00	20	3.33
2	150	7	4.66	15	10.00
3	150	6	4.00	7	4.60
4	150	4	2.66	5	3.33
5	150	5	3.33	10	6.66
6	150	3	2.00	7	4.66
7	150	2	1.33	4	2.66
8	150	1	0.66	3	2.00
9	150	1	0.66	3	2.00
10	150	0	0	2	1.33
	150	3.8	2.53	7.1	5.06

Table-3 – Inventory - Before and After Implementation

Materials	Before Implementation Actual Purchase Time Before Prdn	After Implementation Actual Requirement Time Before Prdn
Fabric	10 **Days**	4 **Days**
Buttons	7 **Days**	3 **Days**
Sewing thread	5 **Days**	1 **Days**
Fusing Foam	8 **Days**	2 **Days**
Mobilon Tape	4 **Days**	1 **Days**
Collar	5 **Days**	2 **Days**
Average	6.5 **Days**	2.17 **Days**

- The product should be manufactured based on the demand and only 2% excess allowance should be kept for compensating defective products.
- The lead time for production will be reduced by minimizing the transportation time and Seven QC tools will help to maintain the quality of the production.
- 5S system will help to maintain the working environment neat and clean.
- Transportation time and handling of the material will get reduced by following the line production system.
- Rework will be reduced by identifying the defects at the starting stage itself. It will reduce money, energy, time, etc.

Conclusion

The lean manufacturing system is the technical production system. This system is mostly followed in the automobile industry. This research is the experiment for implementing the lean manufacturing system in the garment industry. The company should improve the productivity, profit, utilization of resource and quality of the products. Lean manufacturing tools are simple methods to implement in the industry and it doesn't cost much for implementation. But the industry should maintain the continuous follow up and improvement in the system. This system will help to reduce the wastages in the business process, so the company can achieve 94% capacity utilization. So the concern can earn more profit. By implementing JIT, the company can reduce the dumping of materials. It will also help to increase the flow of working capital without scarcity.

Table-4 – Transportation lead time in line & batch Production

Operation	Transportation Lead time in Batch Production	Transportation Lead Time in Line Production
Placket Making SNLS)	30 Seconds	15 Seconds
Shoulder Joining (OL)	18 Seconds	9 Seconds
Sleeve Hem (FL)	15 Seconds	8 Seconds
Sleeve join (OL)	16 Seconds	9 Seconds
Neck Rib Join (SNLS)	19 Seconds	10 seconds
Neck Tape Join (OL)	18 Seconds	12 Seconds
Side Seam (OL)	14 Seconds	14 seconds
Bottom Hem (FL)	15 Seconds	7 seconds
Total	2.41 Minutes	1.40 Minutes

Table-5 – Waiting of the product in BP system: (Checking Department)

Days	Production Quantity(LP)	Checking/Day	Production Quantity(BP)	Checking/Day
1	226	226	173	-
2	227	227	175	173
3	226	226	174	175
4	228	228	174	174
5	227	227	173	174
6	226	226	172	173
7	225	225	172	172
8	227	227	173	172
9	226	226	171	173
10	226	226	173	171
Total	2264	2264	1730	1557

Table-6 – Correction of the product: Before &After Implementation

S.No.	Number of Samples inspected	Number of samples defective (Before Implementation)	Minutes required	Number of samples defective (After Implementation)	Minutes required
1	150	20	109.8	9	38.16
2	150	15	82.35	7	29.68
3	150	7	38.43	6	25.44
4	150	5	27.45	4	16.96
5	150	10	54.90	5	21.2
6	150	7	38.43	3	12.72
7	150	4	21.96	2	8.48
8	150	3	16.47	1	4.24
9	150	3	16.47	1	4.24
10	150	2	10.98	0	0
Total	1500	76	417. 24	38	161.12

Table-7: under utilization of Human Resource

Days	Product per Labour/Day(LP)	Product per Labour/ Day(BP)
1	226	173
2	227	175
3	226	174
4	228	174
5	227	173
6	226	172
7	225	172
8	227	173
9	226	171
10	226	173

Table-8 – The Quality Control

Days	Sample Size	No. of Defects	Fraction Defective
1	150	9	0.060
2	150	7	0.046
3	150	6	0.040
4	150	4	0.026
5	150	5	0.033
6	150	3	0.020
7	150	2	0.013
8	150	1	0.003
9	150	1	0.003
10	150	0	0
11	150	3	0.020
12	150	5	0.033
13	150	6	0.040
14	150	2	0.013
15	150	4	0.026
16	150	5	0.033
17	150	7	0.046
18	150	8	0.053
19	150	9	0.060
20	150	6	0.040
21	150	3	0.020
22	150	4	0.026
23	150	6	0.040
24	150	7	0.046
25	150	9	0.060
26	150	5	0.033
27	150	2	0.013
Total	4050	129	

Table-10

Shows the check sheet for the final inspection of basic polo T-Shirt

Type of Defects	Final Inspection of style (Basic Polo T-shirt) Number of Defects										
	5	10	15	20	25	30	35	40	45	50	Total
Broken buttons	////	////	////	////	////	////					30
Broken Stitching	////	////	//								12
Shade Variation	////	////	/								11
Fabric Defects	////	////	////	////	////	////	////	////	////		45
Untrimmed threads	////	////	////								15
Missing Buttons	////	////	////	////	////						25
Open seams	////	////	////	////	////	////	////	////			40
Unfinished Buttonholes	////	////	////	////	////	////					30

Sample size = 1500; % defective 208/1500 = 13.9

Table-9

Shows JIT purchasing

Materials	Actual Purchase Time Before Production (Days)	Actual Requirement Time Before Production (Days)
Fabric	5	4
Buttons	4	3
Sewing Thread	2	1
Fusing Foam	3	2
Mobilon Tape	2	1
Collar	3	2

References

1. Aitken, J., Christopher, M. and Towill, D. (2002), "Understanding, implementing and exploiting agility and leanness", International Journal of Logistics: Research and Applications, Vol. 5 No. 1, pp. 59-74.

2. Holweg, M. (2007), "The genealogy of lean production", Journal of Operations Management, Vol. 25 No. 2, pp. 420-37

3. Lewis, M.A. (2000), "Lean production and sustainable competitive advantage", International Journal of Operations and Productions Management, Vol. 20 No. 8, pp. 959-78.

4. Narasimhan, R., Swink, M. and Kim, S.W. (2006), "Disentangling leanness and agility: an empirical investigation", Journal of Operations Management, Vol. 24 No. 5, pp. 440-57

5. Naylor, J.B., Naim, M.M. and Berry, D. (1999), "Leagility: integrating the lean and agile manufacturing paradigms in the total supply chain", International Journal of Production Economics, Vol. 62, pp. 107-18. ❑