Elimination of Non-Value Added Activities in Sewing Section of an Apparel Industry Through Value Stream Mapping Analysis

Farhatun Nabi Department of Textile Engineering Bangladesh University of Business and Technology Dhaka, Bangladesh

Abstract—In this study value stream mapping has been done in an apparel manufacturing unit at sewing section, as sewing room is most swarming room comparing with any other departments in this type of organization. Here on a specific product value stream has been done in current state and nonvalue added activity was separated and a future state mapping is proposed for that style of product. About 40.34% non-value added time was eliminated by this mapping and proposed mapping contains a cycle time of only 4.684 minute instead of 8.267 minute. As it reduces non-value added operations,a number of labors werealso reduced to 19 from 32 in proposed state mapping. The research may be extended to the other different areas of the organization for improving current situation and reducing wastages which is unnoticed for so long.

Keywords—Lean manufacturing, value, waste, non value added activity, cycle time, Value Stream Mapping

I. INTRODUCTION

Lean principles originated with objectives of reducing waste, decreasing inventory and operating costs, improving product quality, increasing productivity and ensuring job satisfaction[4]. The focus of this popular manufacturing system is to minimize the consumption of resources and through reducing waste with adding more value to the product or service by ensuring high quality. Lean is most widely used in industries that are assembly oriented or have a high amount of repetitive human process. TaiichiOhno said that, "Lean manufacturing is all about looking at the time line from the moment the customer gives us an order to the point when we collect the cash. And we are reducing that time line by removing the non-value added wastes"[5]. These are typically industries for which productivity is highly influenced by the efficiency and attention to detail of the people who are working manually with tools or operating equipments [1]. VSM is one of the powerful lean tools for an organization wanting to plan, implement and improve on its lean journey [11].Value stream mapping is an enterprise improvement tool to help in visualizing the entire production process, representing both material and information flow [9]. This study is carried out at a reputed knit composite industry situated at Gazipur in Bangladesh and the experiment has been done on a T(tee)shirt.

II. LITERATURE REVIEW

Now a day's customers and consumers want products within the shortest lead time with high quality and minimum

Rezwan Mahmud Department of Textile Engineering Bangladesh University of Business and Technology Dhaka, Bangladesh

cost. To deal with the consumer practice manufacturers have to find out the ways to reduce cost and time. Value stream mapping (VSM) become one of the significant tools of lean manufacturing system.VSM can create a high level look at total efficiency, present a visual representation of material flow, product flow and information flow to identify improvement opportunities and thereby help to identify applicable lean improved tools and their implementation[3].Unlike most process mapping techniques that often, only document the basic product flow, value stream mapping also documents the flow of information within the system, where the materials are stored (raw materials and work in process, WIP) and what triggers the movement of material from one process to the next are key of information[9].Taiichiohno defines pieces waste as;"Anything other than the minimum amount of equipment, materials, parts and working time absolutely essential to production"[10]. Another way to define wastecan beanything, for which consumers are not willing to pay. So for which customer or consumers are ready to pay, may beconsidered asthevalue of that product. Generally customer requirement is divided into three categories: quality, delivery and cost. The degree to which an item, function, or process satisfies requirements of customer or user [6]. Consumer satisfaction again demands on the purchase time or lead time. Soon time delivery issolitarycharacteristics of consumer requirements and then finally comes the term cost. A consumer would not pay more that generally wasted in time of production. So cost is the strongest tool for consumer satisfaction.

In an apparel manufacturing floor VSM is done in various way. Main theme is to identify or separate value added and non value added activity. The non-value added activity is categorized within essential non-value added and nonessential non-value added activity. The objective of a Value Stream Mapping is to provide an overview of the current situation and to identify waste [12].

Value added activity is that processing steps for which buyers are paying or any physical changes in shape or character of products happens. Such as cutting or assembling fabrics for finished apparels. Essential non-value added activities are those steps without which carrying out value added activity may hamper or may not be possible. Like spreading the fabric from fabric roll for cutting etc. But the non essential non value added steps are those which are only wastage, increase price and delay processing time such as numbering or bundling steps or operation in a cutting section.

III. METHODOLOGY

VSM includes a step by step approach to transform a current manufacturing state into a lean future state, which is the basis of its success in practice[8].VSM is done visually separating value added from non value adding activities. In this research following steps are monitored for a specific style:

1. Mention all the operation or steps of job.

2. Create a cumulative chart for that specific style.

3. Measure the time required for each single step of job or operation by time study.

4. Identify the non-value added activity.

5. Separate the each non value added time and make sum.

6. Calculate each value added activity time.

7. Identify the proportion of value added and non-value added.

8. Create the target flow chart by eliminating non value added.

9. Make new operation breakdown for that style.

10. Implement the target (future state) process or operation breakdown in the production floor.

IV. DATA ANALYSIS AND CALCULATION

Scrutinizing the sewing floor for several times actual status of sewing section has been considered for doing value stream mapping. Here current state mapping has been done to identify the non-value added activity. For doing so, at first a specific style is selected to run pilot project. Then for that product operation breakdown is done cumulatively; number of worker, required equipment, cycle time for each job or operation is listed. Then by further analyzing and study each non-value added activity was identified and marked. After that non-value added activities were listed one by one and eliminated from the operation breakdown. TABLE 1 shows the described process practically where highlighted rows are indicating the non-value added activity.

					1 8			()		
	Department	Sewin	Sewing			() s	ers	d qty) u	. ii
# S1	Activities	Area	WorkStation	Start time	Finish time	Time (Minutes) for all activities	Number of workers	Equipment (type and qty)	Cycle time(in min)	Non Value Added (in min)
1	Waiting for front back match	Table		12:02:26 PM	12:09:54 PM	7.47				
2	Front back match	Table	2	12:09:54 PM	12:10:15 PM	0.35	2	Table	0.700	0.700
3	Waiting for shoulder join	Table		12:10:15 PM	12:32:10 PM	21.92				
4	Shoulder join	Sewing line	1	12:32:10 PM	12:32:21 PM	0.18	1	OL4	0.183	
5	Waiting	Sewing line		12:32:21 PM	12:33:17 PM	0.93				
6	Thread cut	Sewing line	1	12:33:17 PM	12:33:25 PM	0.13	1	Cutter	0.133	0.133
7	Waiting for care label attach	Sewing line		12:33:25 PM	12:48:38 PM	15.22				
8	Care label attach at left seam	Sewing line	1	12:48:38 PM	12:48:45 PM	0.12	1	LS	0.117	
9	Waiting for nk join	Sewing line		12:48:45 PM	12:50:53 PM	2.13				
10	Neck tack	Sewing line	1	12:50:53 PM	12:50:58 PM	0.08	1	LS	0.083	0.083
11	Waiting	Sewing line		12:50:58 PM	12:56:07 PM	5.15				
12	Neck rib join	Sewing line	1	12:56:07 PM	12:56:20 PM	0.22	1	OL4	0.217	
13	Waiting	Sewing line		12:56:20 PM	2:12:11 PM	75.85				
14	Thread cut	Sewing line	1	2:12:11 PM	2:12:25 PM	0.23	1	Cutter	0.233	0.233
15	Waiting	Sewing line		2:12:25 PM	2:24:35 PM	12.17				
16	Back neck piping	Sewing line	1	2:24:35 PM	2:24:41 PM	0.10	1	LS	0.100	

TABLE 1.Current state VSM for separating non-value added activity.

		r								
17	Waiting	Sewing line		2:24:41 PM	3:19:43 PM	55.03				
18	Piping tack	Sewing line	1	3:19:43 PM	3:19:55 PM	0.20	1	LS	0.200	0.200
19	Waiting	Sewing line		3:19:55 PM	3:23:00 PM	3.08				
20	Piping cut	Sewing line	1	3:23:00 PM	3:23:04 PM	0.07	1	Scissor	0.067	0.067
21	Waiting	Sewing line		3:23:04 PM	3:33:16 PM	10.20				
22	Front neck top stitch	Sewing line	1	3:33:16 PM	3:33:26 PM	0.17	1	ILC	0.167	
23	Waiting	Sewing line		3:33:26 PM	3:36:32 PM	3.10				
24	Sleeve join	Sewing line	2	3:36:32 PM	3:36:56 PM	0.40	2	OL4	0.800	
25	Waiting	Sewing line		3:36:56 PM	3:37:09 PM	0.22				
26	Thread cut	Sewing line	1	3:37:09 PM	3:37:33 PM	0.40	1	Cutter	0.400	0.400
28	Arm hole top stitch	Sewing line	2	3:37:33 PM	3:38:02 PM	0.48	2	ILC	0.967	
29	Waiting	Sewing line		3:38:02 PM	3:53:11 PM	15.15				
30	Thread cut	Sewing line	1	3:53:11 PM	3:53:26 PM	0.25	1	Cutter	0.250	0.250
31	Waiting	Sewing line		3:53:26 PM	4:12:30 PM	19.07				
32	Side seam	Sewing line	3	4:12:30 PM	4:12:53 PM	0.38	3	OL4	1.150	
33	Waiting	Sewing line		4:12:53 PM	4:14:05 PM	1.20				
34	Thread cut	Sewing line	1	4:14:05 PM	4:14:27 PM	0.37	1	Cutter	0.367	0.367
35	Waiting	Sewing line		4:14:27 PM	4:23:56 PM	9.48				
36	Sleeve close tack	Sewing line	1	4:23:56 PM	4:24:04 PM	0.13	1	LS	0.133	
37	Waiting	Sewing line		4:24:04 PM	4:26:38 PM	2.57				
38	Thread cut	Sewing line	1	4:26:38 PM	4:27:01 PM	0.38	1	Cutter	0.383	0.383
39	Waiting	Sewing line		4:27:01 PM	4:30:15 PM	3.23				
40	Chap tack	Sewing line	1	4:30:15 PM	4:30:21 PM	0.10	1	LSA	0.100	
41	Waiting	Sewing line		4:30:21 PM	4:38:35 PM	8.23				
42	Blind bottom hem	Sewing line	2	4:38:35 PM	4:38:52 PM	0.28	2	OL4	0.567	
43	Waiting	Sewing line		4:38:52 PM	4:47:39 PM	8.78				
44	Thread cut	Sewing line	2	4:47:39 PM	4:47:56 PM	0.28	1	Cutter	0.283	0.283
45	Waiting	Sewing line		4:47:56 PM	5:02:10 PM	14.23				
46	Back neck piping top stitch	Sewing line	1	5:02:10 PM	5:02:21 PM	0.18	1	LS	0.183	
47	Waiting	Sewing line		5:02:21 PM	5:11:41 PM	9.33				
48	thread cut	Sewing line	1	5:11:41 PM	5:11:52 PM	0.18	1	Cutter	0.183	0.183
49	Waiting for quality check	QC table		5:11:52 PM	5:17:01 PM	5.15				
50	Quality check	QC table	2	5:17:01 PM	5:17:10 PM	0.15	2		0.300	0.300
		Total					32		8.267	3.583

A. Calculation

Total cycle time: 8.267 minute Non-value added time: 3.583 minute Value added time: 4.684 minute Non-value added proportion of total time: (3.583/8.267)*100% = 43.34%Value added proportion of total time: (4.684/8.267)*100% = 56.66%Number of operator or worker: 32 Number of worker doing non value added jobs: 13 (Quality checking jobs are essential non-value added) Proportion of worker doing value added activity = (19/32)*100% = 59.37%Proportion of worker doing non value added activity: (13/32)*100% = 40.63%

Cost = Let, minimum amount of wages is 5300 BDT(Bangladeshi Taka), (Actual amount is varied from worker to worker depending on their experience and efficiency)

Total wages for 32 worker = 32*5300 = 169600 BDT Value added activity required = 19*5300= 100700 BDTNon value added activity required = 13*5300= 68900 BDT Proportion for value added activity (100700/169600)*100% = 59.37%Proportion for non-value added activity (68900/169600)*100% = 40.63%

Wastage: 43.34% time or 40.63% labor is wasted for non value added activity.

V. RESULT AND ANALYSIS

It is clear from the discussed session that through value stream mapping current state of production floor can be changed in a more balanced and organized state which we are calling future state mapping. By reducing total cycle time of worker through eliminating unnecessary operations or jobs, total amount of production can be increased. For the studied style cycle time for current state mapping is 8.267 minute where the proposed state mapping cycle time required for that style of product is 4.684 minute. This reduction of time is done by eliminating the non-value added jobs or activities. In this case number of worker is also reduced to a number of 19 from total number of 32. The comparison is stated in TABLE 2.

TABLE 2. Comparison of Value added to the Non-value added activity
--

Parameter	Total	Value added activity	Non-value added activity		
Cycle Time (in minute)	8.267	4.684	3.583		
Labor (in number)	32	19	13		
Cost or wages (in BDT)	169600	100700	68900		

If we consider the cycle time, labor amount and wages in percentages than from above calculation it is comprehensible that non-value added activity is covering a good proportion of share for the following cases. Non-value added activity requires 43.34% time of total cycle time where value added activity contributes 56.66% of time. Same thing happens for labor, value added activity requires 59.37% of labor where 40.63% of labor is wasted through non-value added activity. Table 3 shows comparison for more elastration.

TABLE 3. Comparison of Value added to the Non-value added activity in

percentages						
Topic discussed	Value added activity	Non-value added activity				
Cycle Time	56.66%	43.34%				
Labor	59.37%	40.63%				
Cost or wages	59.37%	40.63%				

Fig.1 shows the proportion of value added activities to the non-value added activities of sewing section.

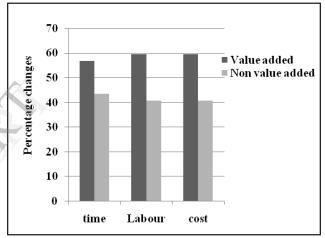


Fig. 1. Proportion of value added to the non-value added activity

VI. CONCLUSION

Industrial managerial position holders always trying to increase their profit revenue and end customers or consumers are trying to get product with better quality and lower price. In this vice-versa condition value stream mapping can be most effective and constructive tool to implement in organizations. VSM is defined as a powerful tool that not only highlights process in efficiencies, transactional and communication mismatches but also guides about the improvements[7]. From thisstudy, it is apparent that by applying VSM in an apparel industries sewing floor, labor amount as well as production time can be reduced easily which is cost effective for sewing section. A Value Stream Mapping is a starting point for improvement projects in which an overview is created of the lead time, processing time and recovery time [12].Findings of this research can be valuable and helpful to other similar apparel industries of Bangladesh, those who expect for better production with quality. Further study may be carried out with-in the other sections of apparel industries.

=

Vol. 3 Issue 12, December-2014

REFERENCES

- [1] Ripon Kumar Chakrabortty,Sanjoy Kumar Paul,"Study and Implementation of Lean Manufacturing Company:Bangladesh Perspective,"Journal of Optimization in Industrial Engineering 7(2011) 11-22.
- [2] Praveen Saraswat, Manoj Kumar Sain, Deepak Kumar, "A review on Waste Reduction through Value Stream Mapping Analysis," International Journal of Research Vol-1, Issue-6, July 2014.
- [3] Bo M., Mingyao D. "Research on the Lean Process Reengineering Based on Value Stream Mapping. Management Science and Engineering",6(2), (2012). 103-106.
- [4] Womack, J.P., Jones, D.T., & Roos, D.(1990) The machine that changed the world: The story of Lean production. New York, Macmilan, Rawsan Associates, 1990.
- [5] Ohno,T.,1988.Toyota Production System:Beyond Large Scale Production.Productivity Press,Cambridge ,MA.
- [6] Dhillon, B.S., "Engineering Maintenance : A Modern Approch", CRC Press, 1st edition, 2002, pp: 04.

- [7] M.Rother, J.Shook, "Learning to see, Lean Enterprise Institute", Cambridge, (1999).
- [8] Lian,H.,Landeghem,H.,"Analysing the effects of lean manufacturing using a value stream nmapping-based simulation generator", International Journal of Production Research, Vol.45, No.13, 3037-3058, 2007.
- [9] Bhim Singh,Suresh K.Garg,Surrender K.Sharma,"Value Stream Mapping:Literature Review and Implications for Indian Industry" The International Journal of Advanced Manufacturing Technology,March 2011,Volume53,Issue 5-8,pp799-809
- [10] Taiichi ohno(1998) Toyota production system, productivity press, new york, pp, ix
- [11] Applicability of value stream mapping(VSM) in the apparel industry in sri lanka- silva, S. K. P. N. Assistant lecturer department of electronic and computer engineering, sri lanka institute of information technology malabe, sri lanka. International journal of lean thinking. Vol-3, issue 1 (june 2012)
- [12] Van Vliet, V. (2013). Value Stream Mapping (VSM). Retrieved [17.12.2014]fromToolsHero: http://www.toolshero.com/value-streammapping-vsm

