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To Estimate the Standard Minute Value of a Polo-Shirt by Work Study

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To Estimate the Standard Minute Value of a Polo-Shirt by Work Study

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Abstract- **This study is based on calculation of standard minute value of Polo-shirt. An experimental investigation for the distribution of SMV for each and every operation require for making a Polo-shirt and provides a clear and details concepts for determining line balancing, machine requirements, man power allocation for setting a definite target within a reasonable efficiency. This study is a details discussion and distribution of SMV which will assist to minimize SMV by having a better synchronization with man, machine, materials and methods to achieve higher efficiency.**

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I. Introduction

The polo shirt would be better named the tennis shirt, since it was first designed by Jean René Lactose, a world-class tennis player who was fondly called the alligator or crocodile because of his vicious playing tactics. Lactose, like many tennis players in the early 20th century, felt tennis garb was restrictive, as players had to wear long sleeved shirts and ties. In 1929, Lactose made the polo or tennis shirt out of pique cotton in a loose knit, with a button down collar that could be flipped up for extra sun protection, and thankfully no tie [1].

As dressing became less formal for men, the polo shirt migrated into popular culture as semi-casual wear. Ralph Lauren's brand Polo was helpful in setting the style of the polo firmly in place in the 1950s. These shirts have even become popular in school uniforms for private and often Catholic schools. While most private schools in the 1970s insisted on boys wearing the more standard non-knit cotton button down, now many simply require a polo shirt in the color the school wears. In the 1980s, Lactose brand polo shirts were for a time, a status symbol for both young men and women.

Though anybody could certainly get less expensive pools, wearing the Lactose with its tiny alligator insignia on the chest was considered highly fashionable. It was associated with the 1980s "Preppy" look [2]. Today's business climate for clothing manufacturers requires low inventory and quick response systems that turn out a wide variety of products to meet customers demand. It is especially in the apparel industry that managers are trying to develop their current systems or looking for new production techniques in order to keep pace with the rapid changes in the fashion industry.

Therefore, to develop a new system, good observation is needed. However, to observe real manufacturing systems is very expensive and sometimes cumbersome [3].

In garment production, until garment components are gathered into a finished garment, they are assembled through a sub-assembly process.

The production process includes a set of workstations, at each of which a specific task is carried out in a restricted sequence, with hundreds of employees and thousands of bundles of sub-assemblies producing different styles simultaneously [4].

The joining together of components, known as the sewing process which is the most labor intensive part of garment manufacturing, makes the structure complex as the some works has a priority before being assembled [5].

Furthermore, since sewing process is labor intensive; apart from material costs, the cost structure of the sewing process is also important. Therefore, this process is of critical importance and needs to be planned more carefully [6].

Assembling process flows from one station to another. In assembly line balancing, allocation of jobs to machines is based on the objective of minimizing the workflow among the operators, reducing the throughput time as well as the work in progress and thus increasing the productivity. Sharing a job of work between several people is called division of labor. Division of labor should be balanced equally by ensuring the time spent at each station approximately the same [7].

Since the late 1970s, the RMG industry started developing in Bangladesh primarily as an export-oriented industry and the domestic market for RMG has been increasing fast due to increase in personal disposable income and change in life style.

The sector rapidly attained high importance in terms of employment, foreign exchange earnings and its contribution to GDP.

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The major importers are European Union, USA and Canada. Knit garments are exported to 148 countries and woven garments are exported to 132 countries [8]. The major buyers are Wal-Mart, target, Marks and Spencer, Tesco, Levi's, Zara, JC Penny, GAP, C &A, UNIQLO etc. It contributes more than 80% of total export earnings.

Since buyer comes to this region for the lowest labor price ($0.11 per shirt for Bangladesh, $0.26 for India, $0.79 for Srilanka), the quality of the garments, efficiency and productivity of Bangladesh RMG sector remain ignored even in the tough competitive market.

Factories in Srilanka operate at 80% - 90% of efficiency, whereas in Bangladesh, according to some experts, productivity is between 35% and 55% of efficiency with very few exceptions. For the RMG sector in Bangladesh, productivity alone can make a difference between life and death [9].

II. Objectives of the Study

The main objective of the study is to determine the manpower and machine allocation for particular target. It is also designed to address the following issues:

- To determine line balancing
- To determine operational sequence of the manufacturing process of Polo-shirt
- To develop the target of the manufacturing process
- To increase the productivity of the company
- To make proper distribution of SMV
- To make better utilization of man, machine and materials

III. Methodology

We have done this experiment in SM Knitwear Ltd. Bangladesh. We attempted this study for proper utilization of man and machine. We made a little bit change of existing line balancing and process layout for number of operations that was done by man power. In this experiment we used auto machines in some operations instead of man power and also find out the performed SMV after the modification of operations.

a) Anatomy of a polo-shirt

A polo shirt, also known as a golf shirt and tennis shirt, is a form of shirt with a collar, a placket with typically two or three buttons, and an optional pocket. Polo shirts are usually made of knitted cloth (rather than woven cloth) usually piqué cotton or less commonly silk, merino wool, or synthetic fibers. A dress-length version of the shirt is called a polo dress.

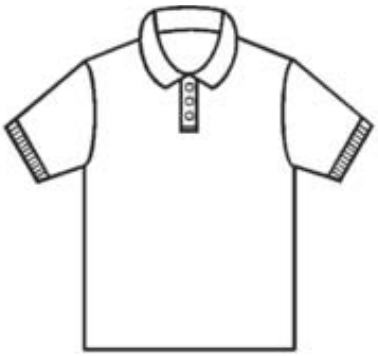

Figure 1: Polo-shirt outline

Table 1: Different components of Polo-shirt

Sl. No.	Parts of a Polo-shirt
01	Collar
02	Placket
03	Front Part
04	Back Part
05	Sleeve
06	Hem

Making process of Polo-shirt

Placket Rolling
↓
Placket Join
↓
Nose Tuck
↓
Shoulder Join
↓
Collar Join
↓
Collar Piping
↓
Upper Placket Top Stitch
↓
Lower Placket Top Stitch
↓
Back Neck Top
↓
Placket top
↓
Placket Box
↓
Sleeve Cuff Join
↓
Cuff Top Stitch
↓
Sleeve Join
↓
Arm Hole Top
↓
Side Seam

↓
Body Hem
↓
Sleeve tuck

↓
Button Hole
↓
Button Stitch

IV. Results And Discussion

Table 2 : Process layout and line balancing of Polo- shirt (Before study)

Sl. No.	Operations	Machines	Stitch type	Man power	
				Helper	Operator
1	Placket position mark	Helper	–	1	
2	Placket fusing	Iron man	–	1	
3	Body scissoring	Helper	–	1	
4	Both placket joint on front part	LS	1N Lock Stitch		2
5	Placket nose tack	LS	1N Lock Stitch		1
6	Placket raw edge cut	Helper	–	1	
7	Lower placket close	LS	1N Lock Stitch		1
8	Upper placket close	LS	1N Lock Stitch		1
9	Placket security tack	LS	1N Lock Stitch		1
10	Placket box	LS	1N Lock Stitch		2
11	Body match	Helper	–	1	
12	Shoulder joint with piping	OL	Over edge Stitch		1
13	Shoulder top stitch	FL	Chain / Flat bed Stitch		1
14	Collar mark	Helper	–	1	
15	Collar over lock	OL	Over edge Stitch		1
16	Collar joint	OL	Over edge Stitch		2
17	Neck piping	FL	Chain / Flat bed Stitch		1
18	Neck top stitch	LS	1N Lock Stitch		1
19	Main label joint	LS	1N Lock Stitch		2
20	Sleeve match and shoulder piping cut	Helper	–	1	
21	Sleeve joint	OL	Over edge Stitch		2
22	Thread cut	Helper		1	
23	Bottom hem	FL	Chain / Flat bed Stitch		1
24	Care label joint	LS	1N Lock Stitch		1
25	Placket servicing	OL	Over edge Stitch		1
26	Side seam	OL	Over edge Stitch		3
27	Thread cut	Helper		1	
28	Side slit tape measure and cut	Helper	–		1
29	Side slit tape attach	LS	1N Lock Stitch		3
30	Side slit tape top stitch	LS	1N Lock Stitch		2
31	Slit security tack	LS	1N Lock Stitch		1
32	Button attach and hole mark	Helper	–	1	
33	Button hole	BH	1N Lock Stitch		1
34	Button attach	BS	1N Lock Stitch		1
				10	34
				Total man= 44	

Table 3 : Process layout and line balancing of Polo- shirt (After study)

Sl. No.	Operations	Machines	Stitch type	Man power	
				Helper	Operator
1	Placket position mark	Helper	–	1	
2	Placket fusing	Iron man	–	1	
3	Body scissoring	Helper	–	1	
4	+Both placket joint on front part	LS	1N Lock Stitch		2
5	Placket nose tack	LS	1N Lock Stitch		1
6	Placket raw edge cut	Helper	–	1	
7	Lower placket close	LS	1N Lock Stitch		1
8	Upper placket close	LS	1N Lock Stitch		1
9	Placket security tack	LS	1N Lock Stitch		1
10	Placket box	LS	1N Lock Stitch		1
11	Body match	Helper	–	1	
12	Shoulder joint with piping	OL	Over edge Stitch		1
13	Shoulder top stitch	FL	Chain / Flat bed Stitch		1
14	Collar mark	Helper	–	1	
15	Collar over lock	OL	Over edge Stitch		1
16	Collar joint	OL	Over edge Stitch		2
17	Neck piping	FL	Chain / Flat bed Stitch		1
18	Neck top stitch	LS	1N Lock Stitch		1
19	Main label joint	LS	1N Lock Stitch		1
20	Sleeve match and shoulder piping cut	Helper	–	1	
21	Sleeve joint	OL	Over edge Stitch		2
22	Bottom hem	FL	Chain / Flat bed Stitch		1
23	Care label joint	LS	1N Lock Stitch		1
24	Placket servicing	OL	Over edge Stitch		1
25	Side seam	OL	Over edge Stitch		2
26	Side slit tape measure and cut	Helper	–		1
27	Side slit tape attach	LS	1N Lock Stitch		2
28	Side slit tape top stitch	LS	1N Lock Stitch		2
29	Slit security tack	LS	1N Lock Stitch		1
30	Button attach and hole mark	Helper	–	1	
31	Button hole	BH	1N Lock Stitch		1
32	Button attach	BS	1N Lock Stitch		1
				8	30
				Total man= 38	

Earlier line was not balanced properly and non-value added helper was used. After study line has been balanced by time and capacity study according to target such as SMV for placket box 0.484, main label joint 0.396, side seam 0.77 and side slit tape attach 0.66. For which operation to achieve target need 1, 1, 2 and 2 operators consecutively but before balancing they used 2, 2, 3, 3 operators and also after over lock operation used helper. After study auto thread trimmer over lock machine has been set for those operations and two helpers have been reduced. Before study man power was 44 and after study man power is 38. Ultimately keeping the target same 6 persons have been saved.

Estimate assembles time of polo-shirt:

Let,

Performance rating = 110%

Machine and personal allowances = 20%

Table 4 : Standard Minute Value (SMV) Calculation

Sl. No.	Operations	Average cycle time in second	Performed SMV
1	Placket position mark	17	0.374
2	Placket fusing	18	0.396
3	Body scissoring	15	0.33
4	Both placket joint on front part	43	0.946
5	Placket nose tack	21	0.462
6	Placket raw edge cut	21.33	0.469
7	Lower placket close	19	0.418
8	Upper placket close	19	0.418
9	Placket security tack	18	0.396
10	Placket box	22	0.484
11	Body match	15	0.33
12	Shoulder joint with piping	20	0.44
13	Shoulder top stitch	20	0.44
14	Collar mark	18	0.396
15	Collar joint	36.66	0.806
16	Collar over lock	19	0.418
17	Neck piping	20	0.44
18	Neck top stitch	20	0.44
19	Main label joint	18	0.396
20	Sleeve match and shoulder piping cut	15	0.33
21	Sleeve joint	31	0.682
22	Bottom hem	16	0.352
23	Care label joint	17	0.374
24	Placket servicing	16	0.352
25	Side seam	35	0.77
26	Side slit tape measure and cut	15	0.33
27	Side slit tape attach	30	0.66
28	Side slit tape top stitch	32	0.704
29	Slit security tack	13	0.286

30	Button attach and hole mark	14	0.308
31	Button hole	13.5	0.297
32	Button attach	14	0.308
	Total Estimated SMV		≈14.552

There are different kinds of polo shirt available in market and sewn in the ready-made garments manufacturing companies such as, polo shirt with single collar, polo shirt with double collar, polo shirt having rib cuff and without rib cuff, short sleeve and long sleeve polo shirt, polo shirt with slit band and without slit band, polo shirt with button and without button. Number of man power required to stitch a garments against a particular line target vary according to the type and style that is selected to stitch hence SMV of the polo shirt vary according to the style and number of operations carried out. And according to the style we can define as basic or critical.

The estimated results have been presented in Table 1, 2, 3 and 4. From the Table 1 we have worked centering a basic polo shirt which contains the parts as front part, back part, placket, sleeve, collar and hem.

Again from the Table 3 it is found that the number of single operations required to stitch the polo shirt is 32 (including operators and helpers) that was 34 before the study (Table 2). And required total number of man power is 44 (34 operators and 10 helpers) before study and 38 (30 operators and 8 helpers) after study.

In the table 4, consider 110 % performance rating and 20% machine and personal allowances. Finally we have got the SMV 14.552 from the Table 4 for the above mentioned polo-shirt.

V. Conclusion

This present study is based on an effective layout model of polo shirt where to use balancing process using short cut method. Here we have suggested following pitch diagram method to identify bottleneck operations and to solve the problem by 100 percent balancing.

During the study we have seen thread trimming is being done manually using helper which is non value added unnecessary operation can be removed by setting auto trimmer along with machine or by using auto machine. The study shows that this balanced layout model has brought a better synchronization among man machine and materials increasing the efficiency and productivity. Traditionally operated garment industries are facing problems like unnecessary operations, wastage, rejection, poor line balancing etc. This problem can be eradicated by getting used with 5S method and making the working environment totally visualized [10]. Here to achieve better quality and cost effective production we can follow Standard Operation procedure (SOP) .When we will follow SOP we will be able to find unnecessary operations and due to follow standard procedure wastage and rejection will gradually come down at a tolerable level or zero. Thereafter in this way we can reach to our expected productivity and efficiency which is the main goal of our study.

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