Faculty of Engineering

Department of Textile Engineering

REPORT ON

Comparative Study on Manufacturing Process of Long Sleeve Polo Shirt & Short Sleeve T-shirt.

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This Report Presented in Partial Fulfillment of the Requirements for the Degree of **Bachelor of Science in Textile Engineering.**

Advance in Apparel Manufacturing Technology
December, 2018

DECLARATION

We hereby declare that, this work has been done by us and not copied from elsewhere; We also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

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LETTER OF APPROVAL

It is here with certified that Md. Rahid Hasan, Sazib Sheikh bearing ID:151-23-4268, 151-23-4166 Department of Textile Engineering, Daffodil International University, Dhaka, Bangladesh, has carried out their B.Sc. thesis entitled **"Comparative Study on Manufacturing Process of Long Sleeve Polo Shirt & Short Sleeve T-shirt."** under my direct supervision. They have successfully carried out their research work and ready to present their dissertation, which is required in partial fulfillment of their B.Sc. degree. This is an original study of the author and no part of this thesis has been to any other university or institute for any degree. The thesis contains no materials previously published or written by any other person except reference is made in the text of the thesis.

I have gone through the final draft of the thesis and recommend its submission for the degree of Bachelor of Science in Textile Engineering.

.....

Supervisor

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Daffodil International University

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DEDICATION

It is our genuine gratefulness and warmest regard that we dedicate this work to our beloved Parents & respected Teachers.

ABSTRACT

Bangladesh knitwear industry keeps great contribution in the Bangladesh economy. Bangladesh now holds number two position in the world in terms of knitwear export and is bandied about as the next possible champion in exporting knitwear product as china is gradually backing out of apparel business. The value addition from the knitwear sector is about 84%. The contribution in GDP is about 7% in FY-2017-18. The ready-made garment (RMG) industry is a strategic sector for Bangladesh. In FY-2013-14,it provided 4.2 million direct jobs, 16 percent of GDP, and more than 75 percent of foreign exchange earnings. Both long sleeve polo shirt and short sleeve t-shirt are same popular as garments. The purpose of this report is to compare the manufacturing process between long sleeve polo shirt and short sleeve t-shirt. Data for this research were collected from Cotton Field (BD) Ltd. of Bangladesh. We have collected data of those manufacturing details such as fabric consumption, sewing, finishing process.

On the basis of the results of this research, it can be said that, there have key difference between polo and t shirt is their design; polo shirts typically have a collar and placket with two or three buttons beneath the collar whereas most t shirts don't have collars. Basis on patterns they have some difference, because Polo shirts come in solid colors or basic patterns such as stripes; they don't have images. T-shirts may come in solid colors, small or big patterns, they will also have images, and similar things printed on them.

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Chapter-1: Introduction

1.1 Introduction:

Bangladesh Knitwear sector contributes to the Bangladesh economy in a distinctive manner. The last 20 years witnessed unparalleled growth in this sector, which is also the largest exporting industry in Bangladesh. It has attained top notch stance in terms of foreign exchange earnings, exports, industrialization and contribution to GDP within a short span of time. The industry plays a significant role in employment generation, women empowerment, poverty reduction, health and Nutrition improvement etc.

Bangladesh is traditionally known for its Textile and Garments sector. But the textile sector was initially import based however the country was famous for Muslin. After the liberation, Bangladesh adopted policy for import substitution industrialization to replace imports focusing on the textile and clothing sectors particularly RMG along with other potential sectors.

The ready-made garment (RMG) industry is a strategic sector for Bangladesh. In FY2013-14, it provided 4.2 million direct jobs, 16 percent of GDP, and more than 75 percent of foreign exchange earnings. Over the past two decades, starting from the early 1980s, Bangladesh has built a strong reputation centered on price advantage via low-cost labor and investment incentives; production capacity, and satisfactory quality levels, especially in value and mid-market price point segments.

The RMG business in Bangladesh started in the late 70s with merely a casual & cursory effort. The first consignment of knitwear export was made in 1973 while the first shipment of woven was made in 1977. In 1981-82 the contribution of woven garments to total exports was about 1.10% whereas the agro-based the then economy received much of her foreign earnings from Jute & Jute products famously known as the Golden Fiber. But with the passage of time from agrarian to manufacturing transformation Bangladesh developed significantly in areas of poverty alleviation, employment, women empowerment, industrial growth and economic diversification - thanks solely to labor intensive RMG sector. Since MFA phase out in 2004 the growth of Bangladesh knitwear has escalated rapidly as statistically supported export volume adduces adequate proof to it despite its somewhat cluttered and shoddy start with absence of rudimentary plans and evolutionary industrial mechanism. In fact, from fiscal year 2007-08 Bangladesh knitwear continues to capture lion's share in national exports (39.93% in FY 2013-14) what was slightly 7.64% in the two decades back, thereby slanting the economy towards knit garments.

1.2 Aim of the study:

- To find out the difference between two order sheet fabric construction.
- To measure the measurement point of the two garments.
- To know the machine lay out, total machine, and total man power for each order.
- To find out the consumption and costing of two different quantity orders.

1.3 Objectives:

- To know the measurement difference between long sleeve polo shirt and short sleeve t-shirt.
- To know the sewing process of both order sheet.
- To know the machine layout for polo shirt and t-shirt
- To know the finishing sequence for t-shirt and polo shirt
- To know the consumption method of both of them

1.4 Scope of the study:

It should be accomplished with practical knowledge in which it is based on Industrial attachment makes us reliable to be accustomed with the industrial atmosphere and improve courage and inspiration to take self-responsibility. To meet the commitments of quality and prompt delivery, Cotton Field (BD) Ltd. decided to integrate the manufacturing process in a planned manner. Over the years the entire process has been integrated by importing sophisticated machinery from world-renowned manufacturers. Working on new concepts in styling & content of the knitwear is a continuous activity in Cotton Field (BD) Ltd. with an objective to up the quality and the value of merchandise. We have concentrated hard with all strengths and resources in developing wide range knowledge about knitwear for the international market. It was the first time of our life we ware gets chanced in an industry for a long time. We have observed gained experience

about different types of machinery and the activities of the operators. We are feeling lucky when we thought we have gained such kind of experience.

1.5 Limitation:

The main limitations of the project are as follows: -

- Due to the shortage of time We could not get at depth knowledge of the quality controller operation and implementation practices in the company, as the period for which We were assigned to work as a quality controller was very short.
- The quality controllers of the company are always busy with their duty, so they could not provide us enough information due to the lack of time. Sufficient records, facts and figures are not available.
- These constraints narrowed the scope of the real analysis. There is no special training department for study. Also there was the lack of the proper guideline.
- Everybody was busy in their personal activity. So, they did not give enough time for us questionnaire which we have asked to them.
- Sometimes they have given answer to us but we did not understand properly. At least eight months required for completion of the final report but we have given only two months. Within two month it is really impossible to understand everything. So to acquire a vast knowledge it is the most important limitation to us.

Chapter-2: Literature Review

2.1 Short Sleeve T-shirt with different parts:

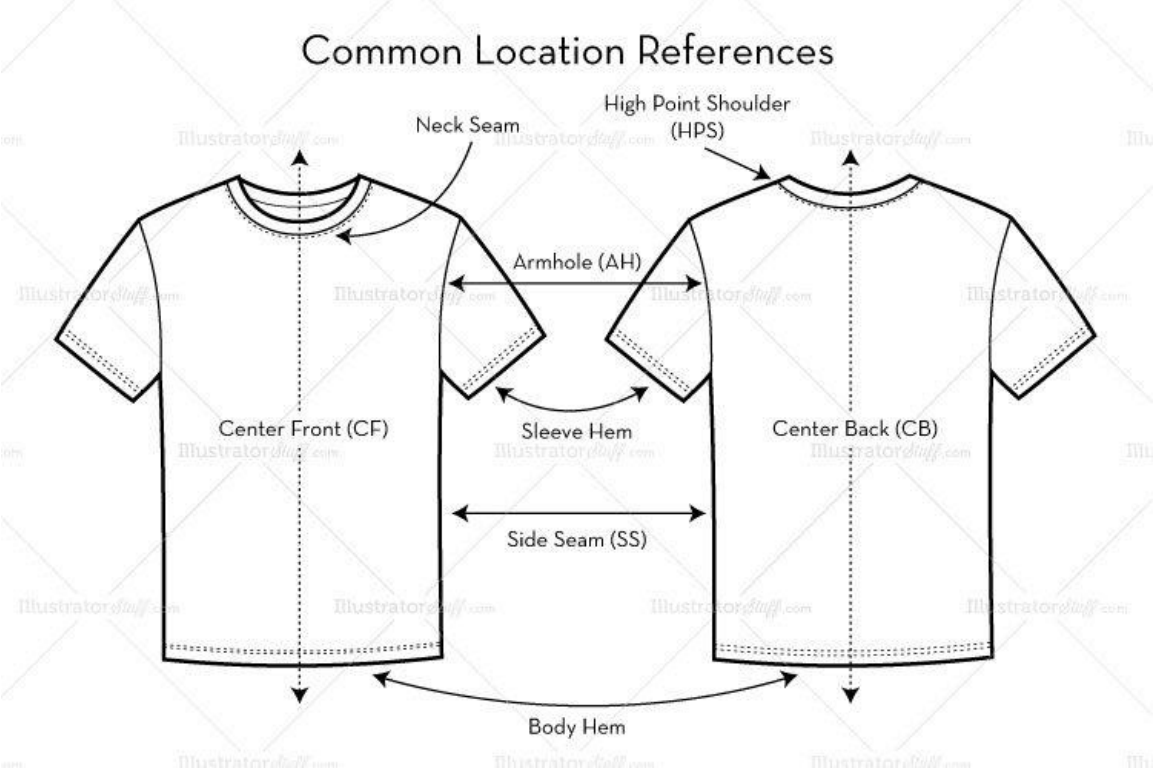


Fig: Elements of T-shirt.

2.2 Long sleeve polo shirt with element:

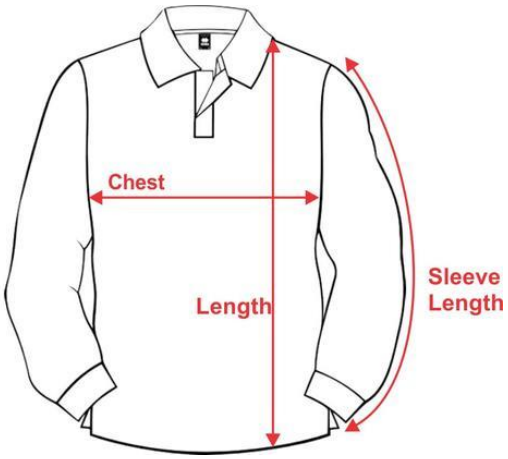


Fig: Front part of long sleeve polo shirt.

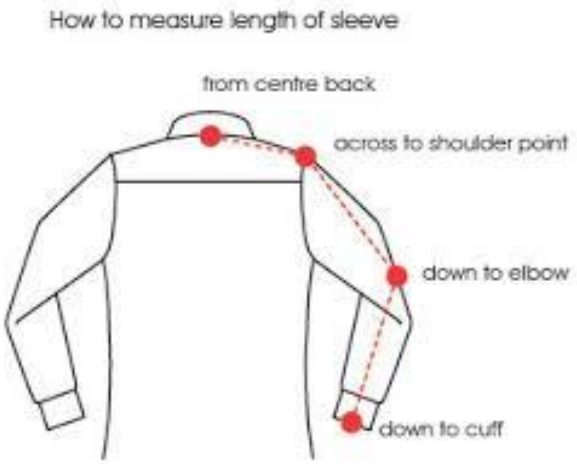


Fig: Back part of long sleeve polo shirt.

2.3 Sewing Machine Used for Polo Shirt & T-shirt Making:

1. **Plain machine.**

Fig: Plain Machine.

Application

1. Placket rolling
2. Moon
3. Neck closing
4. Main label join

2. **Over lock Machine:**

Fig: Over lock Machine.

Applications:

1. Sleeve joint.
2. Collar joint.
3. Neck joint.

3. Flat Lock Machine:

Fig: Flat lock Machine.

Application:

1. Sleeve hem.
2. Neck piping.
3. Bottom hem.

4. **Button Hole Machine:**

Fig: Button Hole Machine.

Applications:

1. To make eye late hole in garments.

5. Button Attaching Machine:

Fig: Button Attaching Machine.

Applications:

1. To attach button in garments.
2. To attach sub button.

6. Bar Tack Machine:

Fig: Bar Tack Machine.

Applications:

1. To created bar tack stitches in garments.
2. Loop attach
3. Fly make
4. Pocket side
5. Front side

2.4 Formula:

Cycle Time: Cycle time includes process time, during which a unit is acted upon to bring it to closer to an output, and delay time during which a unit of work is spent waiting to take the next action.

Basic Time: Average of cycle time.

Standard Minute Value (SMV): Basic Time + Allowance.

$$\textbf{Target SMV} = \frac{\text{Total man power} \times \text{Working Hrs.} \times 60}{\text{SMV}} \times \text{Efficiency\%}$$

Chapter 3: Methodology

3. Methodology

Here we have discussed about 2 order sheet, where one order is based on long sleeve shirt, and others is a t-shirt short sleeve. We compare both of orders details, specification, machine description, number of machines, cutting details, sewing details and finishing process.

3.1 Long sleeve polo shirt:

3.1.1 Order sheet

Buyer: Spring Field

Style No: 5P800

ITEM: Long sleeve polo shirt

Fabric Type: 100% Cotton Pique Carded,

GSM: 200-220

Flat knit collar and sleeve end 1*1 Elasthan rib use

Order: 1800638

Order Receive Date: 20-Sep-2018

Order Shipment Date: 20-Nov-18

Color	Color pantone no	S	M	L	XL	XXL	Total Quantity	Remarks
		01	02	03	04	05		
Sky Blue(10)		400	1000	1200	500	100	3200	
Total							3200	

Description:

1. 5 fly collar used
2. Fabric quality should be good
3. Naps and dead fibers is not allowed on the fabric surface
4. Shrinkage tolerance is up to 4%
5. Color fastness required grade 4-5
6. Twisting tolerance is up to 3%
7. Azo free chemical should be used in fabric
8. Factory must follow P/O shipment date instead of LC date
9. Factory must issue PI as the order confirmation.
10. Factory must take yarn in 7-12 days after order confirmation and start knitting.
11. Short shipment is not allowed and over shipment is allowed up to 5% of total order quantity.
12. Any circumstance finished fabric GSM must be 200 before cutting.

3.1.2 Accessories Details:

Packing Instruction: Single pc poly / 25 pc carton.
Front Print: ROLY 6636 L/S with size.
Back Print: Warning in English and Spanish language and logo of recycle.
Poly printing color: For black and navy color garments: poly printing color will be white. For other color garments: poly printing color will be black.
Label instruction: Roily removal label (Ground color: White/logo and lettering color: black) and satin printed care label.

3.1.3 Measurement:

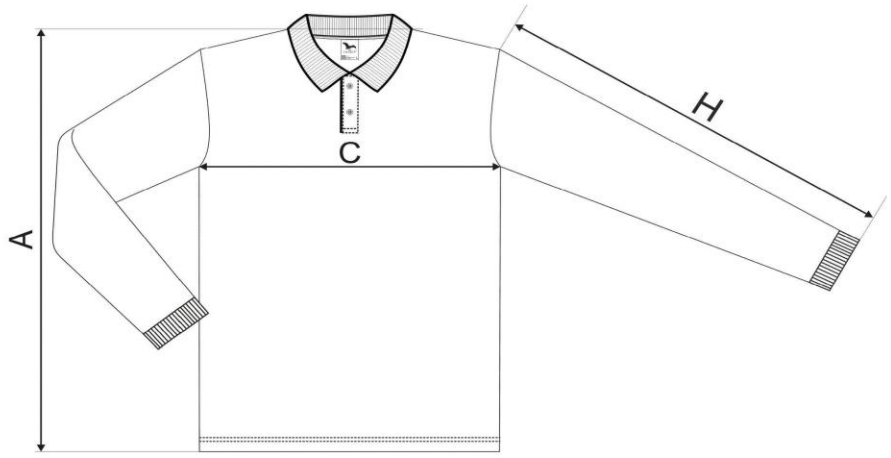


Fig: Long sleeve polo shirt

No.	Measurement point	S	M	L	XL	2XL
A	Half Chest	44	47	50	53	56
B	Half West	50	43	46	49	53
C	Half Bottom	44	47	50	53	56
D	Body length from HPS	63	65	67	69	71
E	Sleeve length including cuff	62	63	64	65	66
F	Half sleeve opening	8.5	9	9.5	10	10.5
G	Sleeve cuff height	5.5	5.5	5.5	5.5	5.5
H	Arm hole straight	22	23	24	24	25
I	Shoulder to shoulder	36	37	38	39	40
J	Neck width open to open	17.5	17.5	18	18	18
K	From neck drop	7	7.5	7.5	8	8
L	Back neck drop	1.5	1.5	1.5	1.5	1.5
M	Collar point	8	8	8	8	8
N	Collar height	8	8	8	8	8
O	Placket length	15	15	15	15	15
P	Placket width	3	3	3	3	3
Q	Bottom stitching height	2	2	2	2	2
R	Shoulder down from HPS to arm hole top	3	3.5	3.5	4	4

3.1.4 Sewing Process:

Process Flow Chart of Polo Shirt Manufacturing Followed in Apparel Industry:

Placket rolling
↓
Moon
↓
Moon top stitch
↓
Neck closing
↓
Placket matching with front
↓
Placket attaching with front
↓
Placket top stitch
↓
Placket tuck
↓
Matching (Front & Back Part)
↓
Shoulder joint with shoulder tap
↓
Shoulder top stitch
↓
Collar cut without thread
↓
Collar tuck with placket
↓
Collar joint with body
↓
Neck piping
↓
Main label joint
↓
Sleeve hem joint with sleeve
↓
Collar back top stitch

↓

Cutting & Matching

↓

Sleeve joint

↓

Placket kasa mara

↓

Placket 1/16 top stitch

↓

Placket tuck

↓

Care label joint

↓

Placket box top stitch

↓

Inspection all back process

↓

Bottom Hem

↓

Side seam

↓

Side band twill tape

↓

Side band tuck

↓

Side band top stitch

↓

Sleeve inside tuck

↓

Sleeve outside top stitch

↓

Side band tuck

↓

Button hole

↓

Button positioning

↓

Button attaching

All the processes have discussed in the below table:

SL No.	Process	Procedure
01	Placket rolling	Placket rolling is done by using plain machine.
02	Moon	Moon is done by using plain machine.
03	Moon top stitch	Moon top stitch is done by using flat lock machine.
04	Neck closing	Neck closing is done by using plain machine.
05	Placket matching with front	Placket matching with front is done on the table.
06	Placket attaching with front	Placket attaching with front is done by using plain machine.
07	Placket top stitch	Placket top stitch is done by using plain machine.
08	Placket tuck	Placket tuck is done by using plain machine.
09	Matching (Front & Back Part)	Matching (Front & Back Part) is done on the table.
10	Shoulder joint with shoulder tap	Shoulder joint with shoulder tap is done by using over lock machine.
11	Shoulder top stitch	Shoulder top stitch is done by using flat lock machine.
12	Collar cut without thread	Collar cut without thread is done by using over lock machine.
13	Collar tuck with placket	Collar tuck with placket is done by using plain machine.
14	Collar joint with body	Collar joint with body is done by using over lock machine.
15	Neck piping	Neck piping is done by using flat lock machine.
16	Main label joint	Main label joint is done by using plain machine.

17	Sleeve hem joint with sleeve	Sleeve hem joint with sleeve is one by using over lock machine.
18	Collar back top stitch	Collar back top stitch is done by using flat lock machine.
19	Cutting & Matching	Cutting & Matching is done on the table.
20	Sleeve joint	Sleeve joint is done by using over lock machine.
21	Placket kasa mara	Placket kasa mara is done by using plain machine.
22	Placket 1/16 top stitch	Placket 1/16 top stitch is done by using plain machine.
23	Placket tuck	Placket tuck is done by using plain machine.
24	Care label joint	Care label joint is done by using plain machine.
25	Placket box top stitch	Placket box top stitch is done by using plain machine.
26	Inspection all back process	Inspection all back process is done on the table.
27	Bottom Hem	Bottom Hem is done by using flat lock machine.
28	Side seam	Side seam is done by using over lock machine.
29	Side band twill tape	Side band twill tape is done by using plain machine.
30	Side band tuck	Side band tuck is done by using plain machine.
31	Side band top stitch	Side band top stitch is done by using plain machine.
32	Sleeve inside tuck	Sleeve inside tuck is done by using plain machine.
33	Sleeve outside top stitch	Sleeve outside top stitch is done by using plain machine.
34	Side band tuck	Side band tuck is done by using plain machine.

35	Button hole	Button hole is done by using button hole machine.
36	Button positioning	Button positioning is done on the table.
37	Button attaching	Button attaching is done by using button attaching machine.

3.1.5 Machine Layout:

The sewing machine is an essential element in the apparel industry. The performance of sewing machine directly related to sewing operation. Before the sewing operation, we have to ensure machine layout in a sewing floor. Generally machine layout depends on order quantity, order style, lead time, etc. Here we are trying to show up basic polo shirt machine layout.

Normally six types of machines are used in making basic Polo Shirt. They are such as plain machine (Single Needle), over the edge (Over lock), Button holing, Button attaching, Bar Tack and Flat lock (Flatbed). But multiple uses, one machine can be used different operation in sewing floor. Here given a machine layout for long sleeve polo shirt-

Sewing Sequences of Long Sleeve Polo Shirt Applied in Garments Industry:

SL No.	Operation	Machine	Man Power
01	Placket rolling	1 P/M	Opr-1, Hlp-1
02	Moon	1 P/M	Opr-1
03	Moon top stitch	1 F/L	Opr-1
04	Neck closing	1 P/M	Opr-1
05	Placket matching with front	Table	Hlp-1
06	Placket attaching with front	1 P/M (Auto)	Opr-1
07	Placket top stitch	1 P/M	Opr-1, Hlp-1
08	Placket tuck	1 P/M	Opr-1, Hlp-1
09	Matching (Front & Back Part)	Table	Hlp-1
10	Shoulder joint with shoulder tap	1 O/L	Opr-1, Hlp-1
11	Shoulder top stitch	1 F/L	Opr-1, Hlp-1
12	Collar cut without thread	1 O/L	Opr-1, Hlp-1

13	Collar tuck with placket	1 P/M	Opr-1, Hlp-1
14	Collar joint with body	1 O/L	Opr-1, Hlp-1
15	Neck piping	1 F/L	Opr-1, Hlp-1
16	Main label joint	1 P/M	Opr-1, Hlp-1
17	Sleeve hem joint with sleeve	1 O/L	Opr-1, Hlp-1
18	Collar back top stitch	2 F/L	Opr-2, Hlp-2
19	Cutting & Matching	Table	Hlp-2
20	Sleeve joint	2 O/L	Opr-2, Hlp-2
21	Placket kasa mara	1 P/M	Opr-1
22	Placket 1/16 top stitch	1 P/M (Auto)	Opr-1
23	Placket tuck	1 P/M	Opr-1, Hlp-1
24	Care label joint	1 P/M	Opr-1
25	Placket box top stitch	2 P/M	Opr-2, Hlp-1
26	Inspection all back process	Table	Opr-1
27	Bottom Hem	1 F/L	Opr-1, Hlp-1
28	Side seam	2 O/L	Opr-2, Hlp-2
29	Side band twill tape	1 P/M	Opr-1, Hlp-1
30	Side band tuck	1 P/M	Opr-1
31	Side band top stitch	2 P/M	Opr-2, Hlp-2
32	Sleeve inside tuck	1 P/M	Opr-1, Hlp-1
33	Sleeve outside top stitch	1 P/M	Opr-1, Hlp-1
34	Side band tuck	1 P/M	Opr-1, Hlp-1
35	Button hole	1 B/H	Opr-1
36	Button positioning	Table	Opr-1
37	Button attaching	1 B/A	Opr-1

Symbol	**Name**	**Man power quantity**
P/M	Plain machine	18
F/L	Flat lock machine	06
P/M (Auto)	Auto plain machine	03
O/L	Over lock machine	08
B/H	Button hole machine	01
B/A	Button attaching machine	01
Opr	Operator	40
Hlp	Helper	30
	Total machine- 37	**Total man power- 70**

3.1.6 List Of Accessories Used in Finishing:

- Main Level
- Size Level
- Care Level
- Hang Tag
- Barcode Sticker
- Poly Bag
- Tag Pin
- Carton
- Hang Tag String
- Clip
- Paper Gum Tape
- Silica Jell

3.1.7 Fabric Consumption and Calculation of Long Sleeve Polo Shirt:

Before going to the consumption calculation, you have to identify the every parts of a knitted polo shirt. A knitted polo shirt consists with the following parts-

1. Body parts (Body + Sleeve),
2. Collar,
3. Cuff,
4. Pocket,
5. Placket.

A knitted polo shirt item order (3200 pcs) with following specification.

- 100% cotton Pique carded fabric for body parts (Body + Sleeve), Half-moon and Pocket. Where fabric GSM is 200-220.
- 1 × 1 Rib fabric for collar. Where the fabric GSM is 400. And cuff GSM 300.

Follow the below measurement chart for (L) Size for 1200 pcs.

Measurement chart (given by buyer Measurement Chart):

Parts name	Actual length	Allowance	Measurement with allowance
Chest	100	5	105
HPS	67	3	70
Sleeve length	64	4	68
Arm hole	48	3	51
Collar length	47	0	47
Collar width	7	2	9
Cuff length	26	4	30
Cuff width	3	2	5

The equation is Cloth per Dozen (CPD) = $(L \times W \times GSM \times 12) / 10^7$

Where,

L= Length of the part,

W = Width of the part,

GSM (Gram per Square Meter) = 220

Fabric Consumption for different parts:

- Fabric consumption for body part.
- Fabric consumption for Sleeves.
- Fabric consumption for Collar.
- Fabric consumption for Cuff

Here,

- Yarn Price per kg- $4.00
- Knitting and Washing Cost per kg- $1.40

- Dyeing Cost per kg- $2.00
- Printing Cost per dozen- $3.50
- Embroidery Cost per dozen- $5.50
- Accessories Cost per dozen- $1.95

a) G.S.M. (given by buyer)

Body= 200-220

Collar (12pcs) =400

Cuff (24 pcs) = 300

b) Sewing & seam allowance 1.50 – 2cm

c) Wastage % 7%

$$\text{A) Fabric consumption for body part. (CPD)} = \frac{L \times W \times 12 \times GSM}{10000000} \text{ kg}$$

$$= \frac{70 \times 105 \times 12 \times 200}{10000000} \text{ kg}$$

$$= 1.76 \text{ kg}$$

$$\text{B) Fabric consumption for Sleeves. (CPD)} = \frac{L \times W \times 12 \times 2 \times GSM}{10000000} \text{ kg}$$

68 x 47 x 12 x 2 x 200

= ..... kg

10000000

= 1.53 kg

L x W x 12 x GSM

C) Fabric consumption for Collar. (CPD) = ... kg

10000000

47 x 10 x 12 x 400

= ..... kg

10000000

= 0.22 kg

L x W x 12 x 2 x GSM

D) Fabric consumption for Cuff (CPD) =..... kg

10000000

30 x 6 x 12 x 2 x 300

= ..... kg

10000000

= 0.13 kg

Fabric Consumption:

{1.76 kg/ dozen (body) + 1.53 kg/ dozen (sleeve) + 0.22 kg/dozen (collar) + 0.13 Kg/dozen (cuff)}

= 3.64 kg/dozen

Total fabric consumption:

Total fabric + 7% wastage

= 4.34 Kg/dozen.

So, fabric consumption for 1 dozen polo shirt is 4.34 kg.

Total amount of (1 × 1) Rib fabric needed for this order is (per dozen),

= {(Fabric consumption for Collar + Fabric consumption for Cuff) + wastage (10%)}

= {(0.22 + 0.13) kg + 7%}

= (0.35kg + 7%)

= 0.375 kg per dozen.

So, 1 × 1 Rib Grey fabrics needed per dozen 0.375 kg.

Total grey fabric needed to make the polo shirt is = (4.34+ 0.375) = 4.7 kg per dozen

Costing for knitted polo shirt:

As yarn price per kg is $4.00 then, total grey fabrics cost per dozen is (4.7 kg × $4.00) = $ 18.8

Total grey fabrics cost per dozen is $18.8

Now, adding all the fabric processing cost (Knitting+ Washing Cost, Dyeing Cost) with grey fabrics cost, actual fabric cost will be achieved.

So,

Actual fabric cost,

= Total Grey fabric cost + [{(knitting cost + washing cost) + dyeing cost} × Total grey fabric] per dozen

= [$18.8 + {($1.40 + $2.00) × 4.7}] per dozen

= $34.78 per dozen.

So,

Actual fabric cost per dozen is…….…. $34.78 …… (A)

Printing Cost per dozen…… $3.50 …….. (B)

Embroidery cost per dozen …… $5.50 ……..…….…….. (C)

Accessories Cost per dozen……..…$ 1.95 ….…… (D)

Cost of making (CM)…….…. $7.00 ……..…… (E)

Commercial cost …….. $0.50 ……..…..…. (F)

Others cost ……. $0.20 ……..… (G)

Here,

By adding A, B, C, D, E, F and G, we will achieve the total FOB cost of garments per dozen for the above order.

Total FOB cost per dozen = (A +B + C + D+ E + F + G)

= $ (34.78 + 3.50 + 5.50 + 1.95 + 7.00 + 0.50 + 0.20)

= $53.48 per dozen.

So, total FOB cost per dozen is $53.48

In buying house costing, profit% for the buying house (here-20%) should be added with total FOB cost per dozen.

So, in this situation, total FOB cost per dozen with profit% stands at-

=$53.48 + 20% commission

= $64.18 dollar per dozen.

Now, total FOB cost per pcs is ($64.18/ 12) = $5.5

So, Buying House costing (FOB) per pcs garment of the above order is $5.5.

3.2 T-shirt Short Sleeve:

3.2.1 Order sheet:

Buyer Name: OSTIN
Order No: 171002452
ITEM Description: T-shirt short sleeve
Fabric Type: 94% cotton 6% elasthan s/j Carded, full feeder
GSM: 180
Order Receive Date: 16-Sep-2018
Order Shipment Date: 16-Nov-18
Color Name and Code: White (01)

Color	Color pantone no	S	M	L	XL	XXL	Total Quantity	Remarks
		01	02	03	04	05		
White(01)		500	1000	1000	500	300	3300	
Total							3300	

Description:

1. Fabric quality should be good
2. Naps and dead fibers is not allowed on the fabric surface
3. Shrinkage tolerance is up to 5%
4. Color fastness required grade 3-4
5. Twisting tolerance is up to 4%
6. Azo free chemical should be used in fabric
7. Factory must follow P/O shipment date instead of LC date
8. Factory must issue PI as the order confirmation.
9. Factory must take yarn in 7-12 days after order confirmation and start knitting.
10. Short shipment is not allowed and over shipment is allowed up to 5% of total order quantity.
11. Any circumstance finished fabric GSM must be 170 before cutting.

3.2.2 Accessories Details:

Packing Instruction: Single pc poly / 25 pc carton.
Front Print: ROLY 6532 with size.
Back Print: Warning in English and Spanish language and logo of recycle.
Poly printing color: For black and navy color garments: poly printing color will be white.
For other color garments: poly printing color will be black.

Label instruction: Roly removal label (Ground color: White/logo and lettering color: black) and satin printed care label.
Tissue: Use tissue for white color garments.

3.2.3 Measurement:

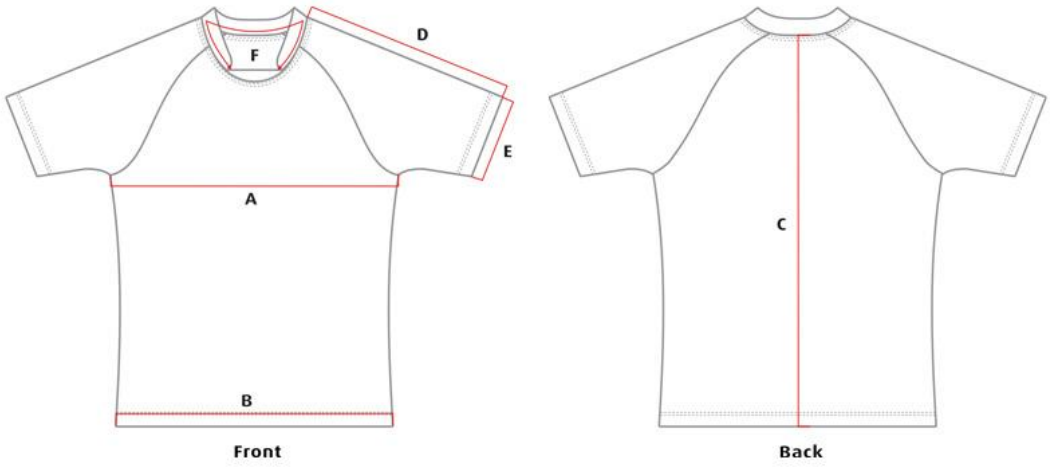


Figure: Short Sleeve T-Shirt.

No.	Measurement point	S	M	L	XL	2XL
A	Half Chest	42	45	48	50	52
B	Half Waist width	38	40	42	44	46
C	Half Bottom	40	42	44	46	48
D	Body length from HPS	58	60	62	64	66
E	Arm hole straight	16.5	18	19	20	21
F	Sleeve length	8.5	8.5	8.5	8.5	8.5
G	Sleeve opening	13	14	15	16	17
H	Shoulder to shoulder	38	40	41	42	43
I	Neck width	16.5	17.5	18	18.5	19
J	Front neck drop	7	7	7	7	7
K	Back neck drop	1.5	1.5	1.5	1.5	1.5
L	Shoulder down	3.5	3.5	3.5	3.5	3.5
M	V-part length	11	11	11	11	11
N	Fancy stitch Width	2.5	2.5	2.5	2.5	2.5
O	Under Arm	4	4.5	4.5	4.5	4.5
P	Arm hole piping width	1	1	1	1	1
Q	Flag label placement at bottom	4	4	4	4	4
R	Neck back tape width	0.8	0.8	0.8	0.8	0.8

3.2.4 Sewing process:

Here we have mentioned the sewing sequence of T-shirt production:

Matching the number and size with back and front part
↓
Join the shoulder
↓
Attached Interlining
↓
Over lock the lining
↓
Ready the neck rib for collar
↓
Join the neck rib piping edge by plain m/c
↓
Neck joint
↓
Over locking the neck
↓
Neck tape join and also attached the size label
↓
Neck rib top stitch
↓
Attached the main label
↓
Sleeve marking and numbering with body parts
↓
Sleeve hem
↓
Sleeve joint with the body part
↓
Attached arm side hem
↓
Side seam and at this moment join the care label
↓
Sleeve tuck
↓

Bottom hem tuck at the end

↓

Bottom hem

↓

Inspection

3.2.5 Machine Layout:

Here you will find out the machine layout plan for t-shirt for 120 pieces per hour. Types of machines that are mostly used in t-shirt manufacturing, but this line balancing should be changed when the t-shirt style are different.

SL NO.	Types Of Operation	Types Of Machine	Machine Quantity	NO. of Operators
01	Join the shoulder	Over lock m/c	1 pc	2
02	Over lock the lining	Over lock m/c	1 pc	2
03	Join the neck rib piping edge by plain m/c	Plain m/c	1 pc	2
04	Neck joint	Over lock m/c	1 pc	1
05	Over locking the neck	Over lock m/c	1 pc	2
06	Neck tape join also attached the size label	Plain m/c	1 pc	2
07	Neck rib top stitch and Attached the main label	Plain m/c	1 pc	2
08	Sleeve hem	Flat lock m/c	1 pc	1
09	Sleeve joint with the body part	Over lock m/c	2 pc	1
10	Side seam	Over lock m/c	3 pc	1
11	Sleeve tuck	Plain m/c	1 pc	2

12	Neck top stitch	Flat lock m/c	1 pc	1
13	Bottom hem tuck at the end	Plain m/c	1 pc	1
14	Bottom hem	Flat lock m/c	1 pc	1
Total Machine		17		21

3.2.6 List of Accessories Used In Finishing for Knitted T-Shirt:

- Main Level
- Size Level
- Care Level
- Hang Tag
- Barcode Sticker
- Poly Bag
- Tag Pin
- Carton
- Hang Tag String
- Clip
- Paper Gum Tape
- Silica Jell

3.2.7 Fabric consumption and costing of Short Sleeve T-shirt:

Fabric is 100% cotton single jersey, and fabric GSM is 180

Order quantity is 3300 pcs.

Then calculate the garments Costing (on FOB) per pcs for this order:

Measurement part	Actual length	Allowance	Measurement with allowance
Body length	62 cm	6 cm	68 cm
Sleeve length	8.5 cm	6 cm	14.5 cm
½ chest width	48 cm	6 cm	54 cm

Solution:

Given that,

- Fabric GSM- 18
- Body length with allowance = 68 cm
- Sleeve length with allowance = 14.5 cm
- ½ Chest width with allowance = 54 cm

Let,

- Yarn Price per kg- $3.20
- Knitting and Washing Cost per kg- $1.00
- Dyeing Cost per kg- $1.70
- Printing Cost per dozen- $4.00
- Accessories Cost per dozen- 1.60

Now, we have to calculate the fabric consumption for this order.

Fabric Consumption:

All the measurements are applied on the following formula

Fabric consumption per dozen, (All measurement in cm),

$$\frac{(\text{Body length} + \text{sleeve length} + \text{allow}) \times (\frac{1}{2}\ \text{chest width} + \text{allow}) \times 2 \times \text{GSM} \times 12}{10000000} + \text{wastage\% (in kg)}$$

$$= \frac{(68+14.5) \times 48 \times 2 \times 180 \times 12}{10000000} + 10\%\ \text{in kg}$$

= 1.71 + 10% (in kg)

= 1.88 Kg per dozen.

So, grey fabrics needed per dozen garments are 1.88 kg.

Costing for Short Sleeve T-shirt:

As yarn price per kg is $3.20 then, grey fabric cost per dozen is (1.88 kg × $3.20) = $6.016

After adding all the fabric processing cost (Knitting+ Washing Cost, Dyeing Cost) with grey fabrics cost, actual fabric cost will be determined.

So,

Actual fabric cost = Total Grey fabric cost + [{(knitting cost + washing cost) + dyeing cost} × 4.72kg] per dozen

= $6.016 + {($1.00 + $1.70) × 1.88} per dozen

= $ 11.092 per dozen.

So,

Actual fabric cost per dozen is……. $ 11.092 …….. (A)

Printing Cost per dozen…… $4.00 ……. (B)

Accessories Cost per dozen……..…$ 1.60 ……..…… (C)

Cost of making (CM)……. $5.00 …… (D)

Commercial cost ……. $0.60 ……. (E)

Others cost ……. $0.20 …… (F)

Now, by adding A, B, C, D, E and F we will get the total FOB cost of garments per dozen.

Total FOB cost per dozen = (A +B + C + D + E + F)

= $ (11.092 + 4.00 + 1.60 + 5.00 + 0.60 + 0.20)

= $ 22.5 per dozen.

Normally, in case of factory, we received the order from a buying hose (Here, we got the order from Fashion Xpress Buying House), so we have to pay 8%commission to them for that order.

So, in this situation, total FOB cost per dozen stands at-

= $ 22.5 per dozen + 8% commission

= $ 24.3 per dozen.

In factory costing, profit% for the factory (here-12%) should be added with total FOB cost per dozen.

So,

Total FOB cost per dozen with profit% stands at ($ 24.3 + 12%) = $ 27.2

Now, total FOB cost per pcs is ($ 27.2 / 12) = $ 2.26

So, factory cost (FOB) per pcs garment is $ 2.26

Chapter-4: Results & Discussion

4.1 Results:

For Long Sleeve Polo Shirt:

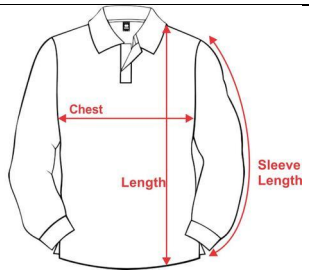
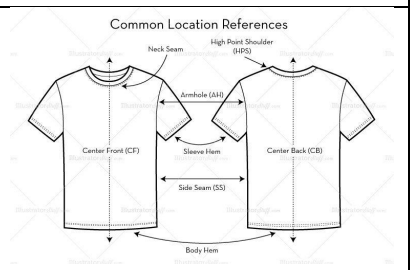
Total FOB cost per pcs is = $5.5

For Short Sleeve T-Shirt:

Total FOB cost per pcs is = $2.26

4.2 Comparison between Long Sleeve Polo Shirt & Short Sleeve T-Shirt:

Topic	Long sleeve polo shirt	Short sleeve t-shirt
Fabric	100% Cotton Carded	94% cotton 6% elastic s/j Carded
G.S.M	Body= 200-220 Collar =400 Cuff = 300	G.S.M = 180
Color Name	Sky blue	White
Sewing process	Done by 37 process	Done by 14 process
Machine layout	Total m/c =37, total man power= 70	total m/c =17, total man power= 21

Consists some major parts	6. Body parts (Body + Sleeve), 7. Collar, 8. Cuff, 9. Pocket, 10. Half-moon.	1. Body length 2. Sleeve length 3. ½ chest width
Sewing & seam allowance	1.50 – 2 cm	1.50- 2 cm
Figure		

Topic	**Long sleeve polo shirt**	**Short sleeve t-shirt**
Cost	• Yarn Price per kg- $4.00 • Knitting and Washing Cost per kg- $1.40 • Dyeing Cost per kg- $2.00 • Printing Cost per dozen- $3.50 • Embroidery Cost per dozen- $5.50 • Accessories Cost per dozen- $1.95	• Yarn Price per kg- $3.20 • Knitting and Washing Cost per kg- $1.00 • Dyeing Cost per kg- $1.70 • Printing Cost per dozen- $4.00 • Accessories Cost per dozen- 1.60
Wastage %	7%	10%

4.3 Discussion:

Comparing on both order sheet of two different buyers we found that the result of consumption is correct as their requirement. The requirement of two buyers is finished fabric GSM must be 200 for long sleeve polo shirt and 170 for short sleeve t-shirt before cutting.

Chapter-5 Conclusion

5.0 Conclusion:

Bangladesh Knitwear sector contributes to the Bangladesh economy in a distinctive manner. The last 20 years witnessed unparalleled growth in this sector, which is also the largest exporting industry in Bangladesh. It has attained top notch stance in terms of foreign exchange earnings, exports, industrialization and contribution to GDP within a short span of time. The industry plays a significant role in employment generation, women empowerment, poverty reduction, health and Nutrition improvement etc.

In this project we try to find out the manufacturing process of long sleeve polo shirt and short sleeve t-shirt. We also collect data from sewing, and finishing process of knit garments. Which is very helpful for us to finish this project perfectly?

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