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CHAPTER-1 PROJECT DESCRIPTION

1.1 Introduction

Esquire Knit Composite Limited was established in 2001. Having the industrial knowledge over 17 years from its sister concern companies namely, **Esquire Dyeing Industries**, **Esquire Knitwear Ltd** and **Synthia Multi Fiber Ltd**, Esquire Knit Composite Limited has focused on its business and successfully established the name as a world-class Garment Manufacturer under one roof having a composite facility of Yarn dyeing, Knitting, Fabric dyeing, and finishing; printing, embroidery, garments dyeing & washing up to Garments making. Making it a right choice for One stop solution for all kinds of knitted garments. The Group currently employs over 8,000 people, serving customers in European and American Chain stores, Fashion Brands and Super markets. Our present Capacity of production goes over 2.00 Million pieces of garments per month.

1.2 History of the Company

Esquire Group is one of the esteemed business conglomerates of the country. It has been proudly and significantly contributing to the society and national economy through creating remarkable employment opportunities and exporting globally.

THE JOURNEY

1989 Establishment of Esquire Electronics Ltd.- A trading co. in electronic goods

1993 Establishment of 1st automated Yarn dyeing project in Bangladesh

1994 Diversification of Yarn Dyeing

1994 Beginning of Garment manufacturing

1995 Beginning of Circular knitting, Fabric Dyeing & Finishing

2000 Further expansion of the Garment Unit

2003 Declared/Awarded ‘Supplier Of The Year’ for C&A for the first time

2005 Venture into US market due to abolition of Quota

2006 Expansion project undertaken to double the total capacity
2014 Established of Esquire Testing Services Limited (ETSL)

Esquire Knit Composite Limited (EKCL) is a strategic business unit of Esquire Group was incorporated as a private limited Company on 16 February 2000 under the Companies Act 1994 and converted to public limited company on 22 January 2015.

EKCL is exporting RMG to the EUROPE & AMERICAN chain store, fashion brands and super markets. the major international buyers of the Company such as C&A, Best Seller, Ostin, Espirit, Mascot, Celio, Next, Tee Jays, Tchibo, Pull & Bear etc. EKCL is proud member of **The Bangladesh Garment Manufacturers and Exporters Association (BGMEA)**, Bangladesh Knitwear Manufacturers & Exporters Association (BKMEA), Bangladesh

German Chamber of Commerce, Bangladesh -Spain Chamber of Commerce, Bangladesh-France Chamber of Commerce

1.3 Achievements and Certifications

Esquire Knit Composite Limited has successfully certified to ISO 9001 (quality management system), ISO 14001 (environmental management system), ISO 18001 (occupational health & safety management system) under the scope of UKAS (United Kingdom Accreditation Service), system certification scheme. EKCL is also oeko-tex standard 100 certified Company for usage of environmental friendly dyes stuffs and chemical approved by Hohenstein Textile Testing Institutes, Germany as well as Global

Organic Textile Standard (GOTS), Organic Content Standard (OCS-IN) certification.

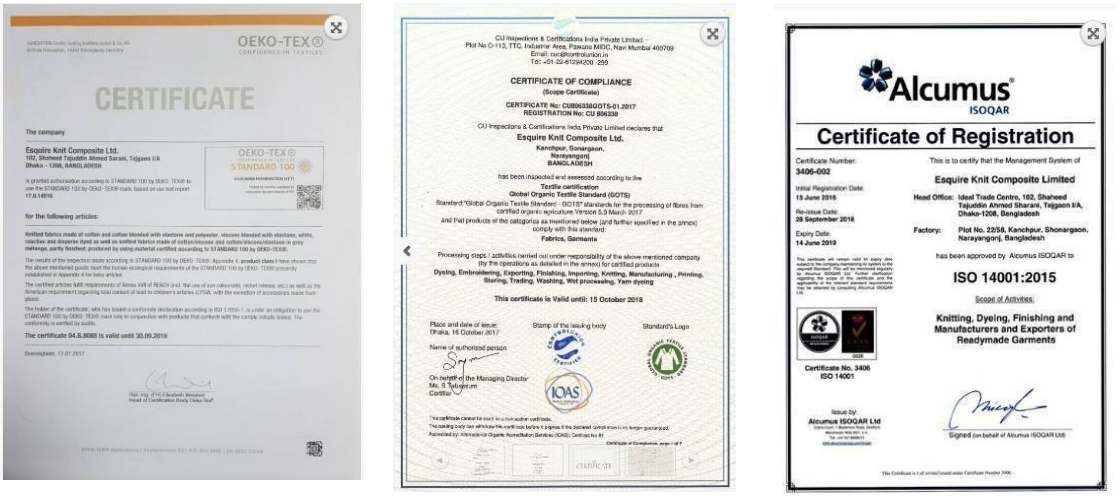


Fig. 1.1 International certificates (OEKO-TEX,GOTS,ISO1 14001)

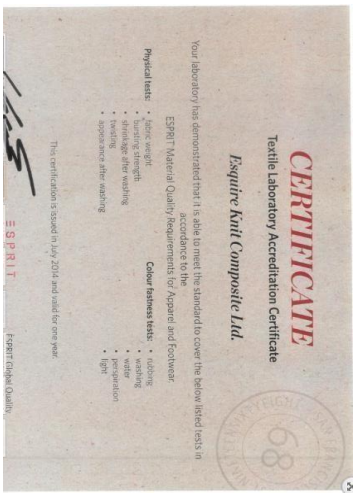


Fig. 1.2 International certificates (Esprit, OHSAS 18001, OCS)

1.4 General Description

Table 1.1 Esquire Knit Composite Ltd. overview

Total Land Area	11.5 acres
Floor Space	5,70,000 sq. feet
Year of Establishment	1996
BKMEA Membership	809
Type of Mill	100% export oriented knit composite mill.
0wner & Investor	Md. Mofazzal Hosain
Project cost	Nearly 40,00,00,000 tk.
Major Clients	Esprit – Germany. Marks & Spencer - UK C&A – Germany Zara – Spain Celio – France Jordache – USA Mascot – Denmark Bhs – UK

Compliance	The factory is fully compliant to International requirements and is regularly audited by BSCI, SMETA , SOCAM, CSCC, SGS, ITS etc.
Company logo	
Type of product	Fancy Dresses, Tops for Girls and Lady. Embellished polo , Rugby shirts,. Hoody & Sweat shirts . Infant and Baby's Body suit and Sleep suit. Embellished T shirts etc.

Table 1.2 Esquire Knit Composite Limited (As per prospectus)

Nature of Business	Esquire Knit Composite Limited is 100% export oriented Company. It produces different types of Knit Garments through its six units namely: Knitting unit, Fabric dyeing unit, Printing, Embroidery, Industrial laundry and Garments unit and sells the same to foreign buyers including C&A buying KG, Best Seller, Esprit, Mascot, Celio, Next, Tee Jays, LIDL.

Major Products	Ready Made Garments (Knit)	
Use of IPO Proceeds	**Particulars**	**Amount (Tk.)**

	Procurement of Garments machineries for new project at Valuka , Mymensingh	431,396,000 (28.76%)
	Building and Civil Construction at Valuka, Mymensingh	1,004,215,500 (66.95%)
	IPO expense (Approximately)	64,388,500 (4.29%)
	Total	**1,500,000,000 (100.00%)**
NAV per share with revaluation	Tk. 49.27 as on June 30, 2018	
NAV per share without revaluation	Tk. 29.40 as on June 30, 2018	
Earnings per Share (Basic)	Tk. 3.44 for the year ended on June 30, 2018	
Issue Manager	Prime Finance Capital Management Limited	
Registrar to the Issue	ICB Capital Management Limited	
Auditor	ACNABIN, Chartered Accountants	
Website	www.esquireknit.com	

1.5 Joint Venture

1. Esquire Knit wears Limited.
2. Esquire Dyeing Industry Limited.
3. Esquire Knit Composite Limited.
4. Esquire accessories Limited.

5. Esquire Testing Service Limited.
6. MMH textiles Limited.
7. Fashion Paradise Limited.
8. Synthetic Multi-fiber Limited

1.6 Esquire Team

Another major asset to their sophisticated production facilities and technical expertise is their team of experienced and qualified people who are committed to achieve maximum customer satisfaction by delivering superior value products. The team works under the guidance of their Chairman Mr. Mofazzal Hossain, under whose leadership, the company has reached so far in this business. Their senior management includes:

1. Mr. Md. Mofazzal Hossain (Chairperson of the group)
2. Vimarsha Peiris-C.O.O (Apparel)
3. Mr. Ghazi A. Rajiv (G.M, Marketing and Merchandising)
4. Satya Barua (Head of Fabric)
5. Md. Tanvir Hassan Bhyuiyan (DGM, Yarn Dyeing)
6. Thirimadura Chaminda Upul Mendis (Head of Product Development)
7. N.L. Chandana (Head of IE)
8. Suresh Prasanna De Silva (AGM, Cutting)
9. Md. Rashidun Nabi (AGM, Maintenance)
10. Md. Shafiul Alam Shah (AGM-Knitting)
11. Md. Reazul Karim (Manager, Embroidery)

1.7 Different Departments

To ensure smooth running of various activities, some departments are available they are given bellow:

Knitting department:

1. Knitting
2. Inspection

Knit dyeing department:

1. Batch section
2. Store house for dyes & chemicals

3. Dyeing Section
4. Lab & QC
5. Finishing

Yarn Dyeing department:

1. Batch section
2. Store house for dyes & chemicals
3. Dyeing Section
4. Lab & QC
5. Finishing Section **Garments department:**

1. Merchandising
2. Sample
3. Production

Maintenance department:

1. Electrical
2. Mechanical
3. Utility Section

Accounts & commercial department

HR and compliance department

Planning department

Quality assurance and control department

Supply chain management department

Printing department

Embroidery department

Industrial Engineering department

Fashion studio department

Store and inventory department

1.8 Location

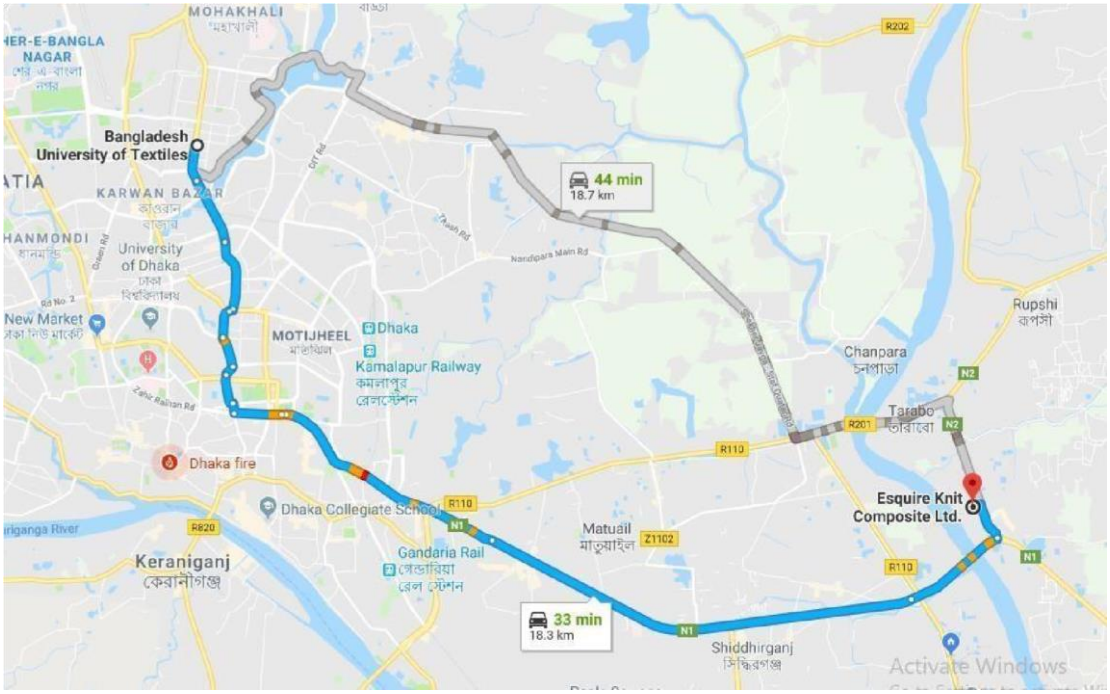


Fig. 1.1 Google map view of EKCL

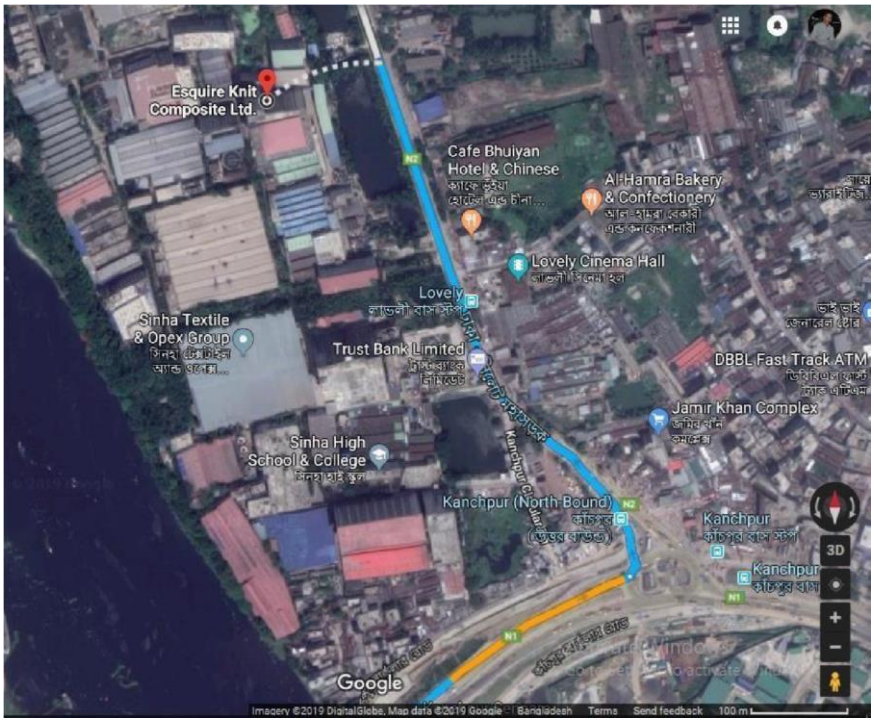


Fig. 1.2 Satellite view of EKCL

1.9 Head office

Ideal Trade Centre plot no-22/58

102, Shaheed Taj uddin Ahmed Sarani
Tejgaon I/A, Dhaka – 1208

Tel : 9129396, 9113161, 9112539

Mobile: 0171835133

E-mail: knitting5@esquirebd.com

Fig. 1.6 Esquire Knit Composite Limited

CHAPTER-2 MANPOWER MANAGEMENT

2.1 Organogram

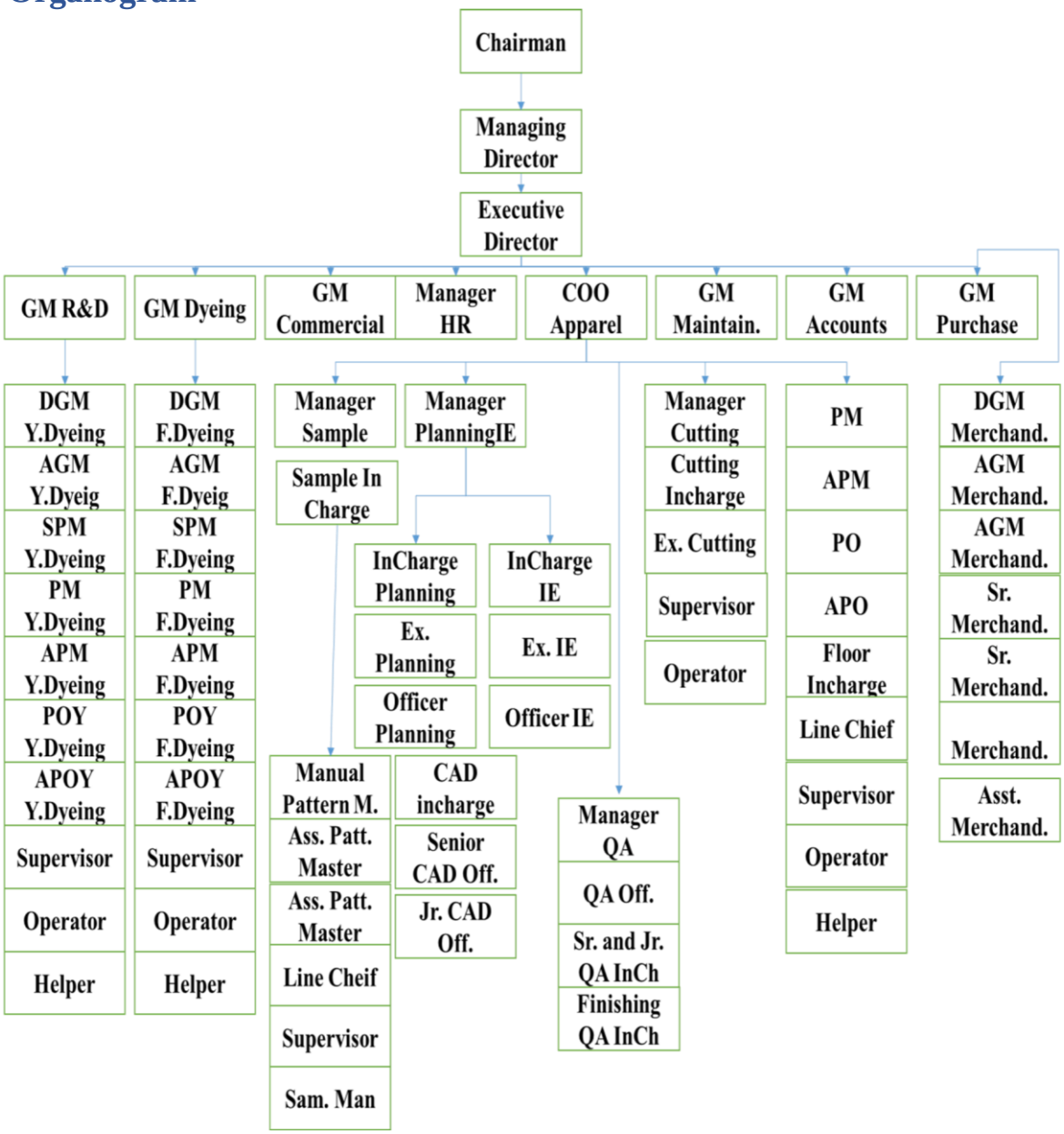


Fig. 2.1 Organogram of EKCL

2.2 Shifting System

Shift changes after a week on Saturday. There are three shifts in this factory and each shift is of twelve hours. Shift is changed after a week on Saturday.

Shift A: 6.00 AM to 2.00 PM

Shift B: 2.00 PM to 10.00 PM

Shift C: 10.00 PM to 6.00 AM

General shift: 8:00 am –5:00 pm

2.3 Staff and Employment Attendance System

Everyday factory needs to track down all the people working in there. Different organization use different methods.In Esquire Knit Composite Limited they use facial recognition system.

Fig. 2.2 Facial recognition attendance

CHAPTER -3 MACHINE DESCRIPTION

3.1 Cutting Section Machines

Table 3.1 Cutting section machine list

Automatic spreading machine	06
Automatic cutting machine	03
Straight knife	18
Fabric relaxation machine	03
Band knife	01
Round knife	02

3.1.1 Fabric Relaxation Machine

Auto edge alignment fabric loosening and rolling machine: This machine is applicable to knit cloth and elastic cloth. It can align clothing during loosening.

Fig. 3.1 Auto edge alignment fabric loosening and rolling machine

3.1.2 Automatic Spreading Machine

M/c name: Automatic spreading m/c

Brand: Lectra

Origin: France

Spreading speed :(8—10) m/min

Spreading width: Max 90”

Table length: 22m

Operating system: Manual button/ automatic

Service: Aamra

Fig. 3.2 Automatic Fabric Spreading Machine

3.1.3 Straight Knife Machine

M/c name: Straight knife cutting m/c

Brand: KM Mack

Origin: Japan

Blade length: (8-9) inch

Blade width: .8 inch

Cutting height: 6 inch

Blade sharper: sharper belt

Motor RPM: (3000-3600)

Current: 2.7A

Fig. 3.3 Straight knife

3.1.4 Automatic Cutting Machine 1.

Vector MX Fashion m/c specification:

Computerize straight knife cutting m/c.

Brand: Lectra

Origin: France

Software: Pilot V1R1

Blade:-width: 2.4cm

-Length: 8.5cm

-Model: Lectra HQ F8301 (MR6, MH, MX m/c **Blade sharper:**

-Max sharing belt.

-Duration: 1pair 1hr

-Sharpe distance: (2.5—3cm) depend on ply height.

Cutting speed:

-Max 100m/min then min 10m/min (normal fabric, s/j, d/j, fleece) -Max 20m/min then min 2/m/min (critical fabric, Lycra, rib) **Vacuum pressure**:

- (0---100) mbar

-30mbar-----low ply &GSM

-70, 80, 100mbar ---- higher ply &GSM

Max cutting width: 85”

2. Vector VT 7000 Fashion m/c specification:

Computerize straight knife cutting m/c.

Brand: Lectra

Origin: France

Softer: Vector Pilot

Blade:-width: 2.4cm
Length: 8.5cm

Cutting speed: 50m/min & 100m/min (2 point fix)

Vacuum pressure :(50-100) mbar

Blade sharper: Grande stone (3 pcs) stone change one by one,

Blade duration: 3 day

Fig. 3.4 Automatic Fabric Cutting Machine

3.2 Sewing and Finishing Section Machines

Table 3.2 Machine Inventory 2019

SL.	Machine Name	U - 1	U - 2	U - 3	U - 4	U - 5	U - 6	Sample
1	Plain Machine (Auto)	104	100	103	101	110	105	32
2	Plain Machine (Manual)	54	32	62	48	46	55	46
3	Plain Machine (DNLS)		2	3	3	3	1	
4	Vertical Plain Machine	15	9	13	11	13	11	
5	Overlock Machine (4Thread)	125	116	122	102	123	109	40
6	Overlock Machine (3Thread)		2	1	1		1	4
7	Overlock Machine (5Thread)							1
8	Overlock Machine (Cutter)	12	10	10	7	6	6	2
9	Flatlock Machine, Hemming	14	16	11	12	13	11	2
10	Flatlock C/B Puller Machine	1	8		2		1	1
11	Flatlock Lace Attach Machine		3					
12	Flatlock Waist Belt Machine			1	3			

13	Flatlock C/B (Big)	20	22	35	21	26	28	8
14	Flatlock C/B (Small)	11	10	8	9	7	9	6
15	Flatlock Flatbed Top Stitch							4
16	Flatlock C/B Piping	15	2		1			
17	Flatock Flatbed Piping		17	12	9	16	12	6
18	Feed up the Arm Machine	3	2		4		2	
19	Button Attach Machine	10	4	12	5	10	7	2
20	Button Hole Machine	8	3	12	6	10	8	3
21	Bartack Machine	10	10	6	4	6	9	2
22	Back Tape Machine			1				2
23	PMD Machine (Kansai)	2	2			4	4	2
24	Design Stitch Machine	3			1		1	
25	Picoting Stitch Machine							1
26	Scallop Stitch Machine							1
27	Zigzag Machine							1
28	Chain Stitch Machine (1Needle)	1			1	1		
29	Chain Stitch Machine (2Needle)	3	2			2		
30	Feed of the Arm Machine				1		1	
31	Smoking Machine							2
32	Saddle Stitch Machine							1

33	Flat Seamer Machine					16		2
34	Automatic Pocket Setup Machine							
35	Heat Press Machine	1	4	7	5	5	5	
36	Plastic Stapler Machine		1			1		
37	Vacuum Iron Table	20	20	21	21	21	22	8
38	Thread Recon Machine		1					1
39	P.P Belt Machine		1		1	1	1	
40	Rip Cutter Machine	2	2	2	2	3	2	1
41	Snap Button Machine	3		3		2	1	1
42	Collar Tricking Machine							
43	Hand Needle Detector Machine	1	1	1	1	1	1	1
44	Fusing Machine	1	1	1	1	1	1	
45	Thread trimmer Machine							
46	Thread Sucker Machine	2	2	2	2	2	2	
47	Spot Remover Machine							
48	Needle Detector Machine	1	1	1	1	1	1	

3.2.1 Sewing Machines

Sewing machine brands:

- Juki
- Brother
- Yamato
- Hikari
- Pegasus
- Siruba

Fig. 3.5 Single needle lock stitch machine (Brother)

Fig. 3.6 Flatlock machine (Pegasus)

Fig. 3.7 Overlock machine (Hikari)

3.2.2 Other Machines **Fusing machine:**

Machine brand: HASHIMA

Machine model: HP-450MS

Machine serial number: 16915

Fig. 3.8 Fusing Machine

Thread sucking machine: NISHO Thread sucking machine

Model: NH-TS-5600

Inhaling pressure: ≤ 400 Pa

N.W: 160 Kg

Metal detector machine (Conveyor type):

HASHIMA needle detector machine

Detection method: Magnetic induction system

Model: HN-750G

Belt speed: 30m/min

Weight: 400 kg

Fig. 3.9 Hand needle detector

Fig. 3.10 Metal detector machine (Conveyor type)

Fig. 3.11 NISHO thread sucking machine

3.3 Printing Section Machines

- Auto printing machine performer 14 color
- Auto printing machine challenger 18 color
- Auto printing machine diamondback 8 color
- Gas dryer sprint
- Sublimation printing machine **3.3.1 Specifications**
- Auto table dryer **1. Auto Heat pressing m/c (10 pcs):**

- CNC engraving machine

Stone printing m/c

- Sublimation heat press machine
- Auto heat press machine Brand: Apollo
- Exposure machine Origin: china
- Heat press machine Bad size: (18 x 14) inch
- Seamless heat press machine

Max temp: (150—400) ºc Model: PTA-850

2. Sublimation value jet

Model: VJ 1638 Dual head

5. Automatic stone printing m/c (1pcs):

Name: CAMS 4H—3P Brand:

3. CNC Engraving machine

Youngman

Origin: Korea

Model: LX-CO1-1, LX-CO5

Software: Gem Master (for motif design)

4. Flat heat press machine

6 color use at a time

Stone press by air pressure

3.4 Embroidery Section Machines

Table 3.3 Embroidery machine list

Name	Brand/Model	Quantity	Head	Needle/ Head
Automatic tubular embroidery machine (Motif)	SWF (sunstar)/M-UK 204-50	01	08	No needle is used
Multi head automatic embroidery machine	SWF (sunstar)/K-WE 920-75	07	20	9/20
Multi head automatic taping embroidery machine	SWF (sunstar)/TB-WJ616-75	01	20	9/20

Multi head automatic embroidery machine	SWF (sunstar)/E-WD 920-75	02	20	9/20
Electronic Multi head automatic embroidery machine	MG/MG (S)-920/533	06	20	9/20
Multi head automatic chenille embroidery machine	SWF (sunstar)/CE-Series	01	20	9/20
Multi head automatic embroidery machine (sample)	SWF (sunstar)/SBseries	01	8	9/8
Electronic Multi head automatic embroidery machine (sample)	MG/MG (H)-906/536	01	6	9/6

Fig. 3.12 Automatic multi-head Tapping embroidery machine

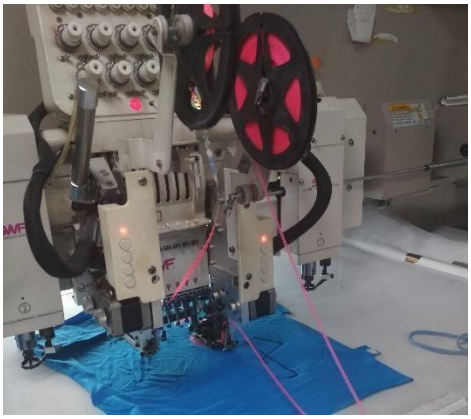


Fig. 3.13 Multi head automatic chenille embroidery machine

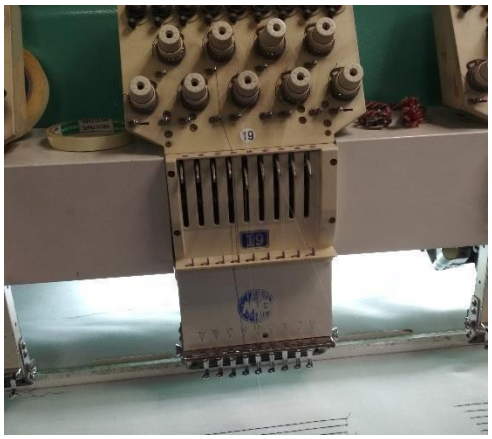


Fig. 3.14 MG/MG (H)-906/536

3.5 Garments Washing and Dyeing Machines

Table 3.4 Washing and dyeing machine list

Type	Model/Brand	Quantity	Capacity
Washing and Drying	YILMAK HBM 5024S	1	180 kg
Washing and Drying	YILMAK HBM 1300S	1	40 kg
Washing and Drying	YILMAK HBM 250S	1	7 kg

Tumbler Dryer	YILMAK HNS 2000	6	100 kg
Tumbler Dryer	YILMAK HNS 600	1	30 kg
Tumbler Dryer	YILMAK HNS 4069	2	200 kg
Hydro-extractor	YILMAK HG 120	2	120 kg
Washing	Smartex 340	2	340 kg
Spray cabin	YILMAK HI 102/2	1	600 pcs per day
Sample dyeing	Century	4	15 kg
Washing and Dyeing	Century	5	150 kg
Dryer	Dryer 300	6	300 kg
Dryer	Dryer 30	1	30 kg

Fig. 3.15 Hydro-extractor

Fig. 3.16 Tumbler dryer

Fig. 3.17 Washing and dyeing machine

3.6 Yarn Dyeing Machines

Table 3.5 List of machines in yarn dyeing section

SL.NO.	Machine Name	M/C Description	Brand Name	Country of Origin	Capacity (kgs)	Number of machine

1	CH-400	HT HP Dyeing machine	Tong Geng	China	400	1
2	CH-300	Do	Do	Do	300	1
3	CH-200	Do	Do	Do	200	2
4	CH-100	Do	Do	Do	100	2
5	CH-50	Do	Do	Do	50	2
6	CH-30	Do	Do	Do	30	1
7	CH-15	Do	Fong's	Do	15	3
8	AL-400	Do	Do	Do	400	1
9	AL-200	Do	Do	Do	200	1
10	AL-30	Do	Do	Do	30	1
11	AL-6	Do	Do	Do	6	2
12	LP-1000	Do	Do	Do	1000	2
13	LP-600	Do	Do	Do	600	1
14	GL-400	Do	Galvanin	Italy	400	1

15	GAL-15	Do	Do	Do	15	4

16	Pozzy Hydro	Hydro-extractor	Pozzy	Italy	2500/day	1
17	Galvanin Hyrdo	Do	Galvanin	Italy	2500/day	3
18	Pozzy Dryer	HF Dryer	Pozzy	Italy	3000/day	1
19	Strayfield Dryer	Do	Strayfiled	Italy	3000/day	1
20	Galvanin Dryer	Do	Galvanin	Italy	2500/kg	3

Table 3.6 Soft winding machine

SL.NO.	M/C Description	Type of M/C	Brand Name	Country of Origin	Capacity	Number of Machine
1	Soft Winding	Semi Automatic	HWAA	Taiwan	64/Doff/M/C	18
2	Soft Windig	Fully Computerize	SSM	Switzerland	80/Doff/M/C	2

Table 3.7 Hard Winding Machine

SL.NO.	M/C Description	Type of M/C	Brand Name	Country of Origin	Capacity	Number of Machine
1	Hard Winding	Fully Computerized	SSM	Switzerland	84/Doff	2
2	Do	Semi Auto	HWAA	Taiwan	Do	3
3	Do	Semi Auto	HWAA	Taiwan	120 Doff	3

Fig. 3.18 HTHP yarn dyeing machine

Fig. 3.19 Hard winding

3.7 Knitting Machines

Table 3.8 Knitting machine list

Machine Name	Origin	Diameter	Gauge	Type
Mayer & Cie	Germany	36”	24	Single Jersey
Do	Do	34”	24	Do
Do	Do	36”	20	Do
Do	Do	30”	24	Do
Do	Do	34”	20	Double Jersey
Do	Do	32”	20	Do
Orizio Paolo	Italy	34”	24	Do
Pailung	Taiwan	34”	24	Do
Do	Do	30”	20	Single Jersey
Orizio Paolo	Italy	26”	24	Do
Do	Do	30”	20	Do

FUKUHARA	Japan	30”	24	Do
FUKUHARA	Do	30”	18	Double Jersey

Fig. 3.20 Shima Seiki flat knitting machine

Fig. 3.21 Automatic hand glove knitting machine

Fig. 3.22 Fabric inspection machine

3.8 Dyeing Machines

Table 3.9 Dyeing machine lists

Manufacturer	Type	Capacity	Machine number
Athena by Sclavos, Greece	HTHP Dyeing M/C	250 kg	4
Athena by Sclavos, Greece	HTHP Dyeing M/C	500 kg	3
Athena by Sclavos, Greece	HTHP Dyeing M/C	750 kg	6
Athena by Sclavos, Greece	HTHP Dyeing M/C	1000 kg	2
Athena by Sclavos, Greece	HTHP Dyeing M/C	1250 kg	1
Athena by Sclavos, Greece	HTHP Dyeing M/C	50 kg	3
Fong's, Hong Kong	HTHP Dyeing M/C	120 kg	1
Fong's, Hong Kong	HTHP Dyeing M/C	30 kg	2

Fong's , Hong Kong	HTHP Dyeing M/C	20 kg	1
HAF-30, Taiwan	HTHP Dyeing M/C	30 kg	2
KRSNA, India	HTHP Dyeing M/C	10 kg	2
Athena by Sclavos, Greece	HTHP Dyeing M/C	20 kg	1

Fig. 3.23 Athena HTHP dyeing machine

Fig. 3.24 Fong's dyeing machine

Fig. 3.25 KRSNA sample dyeing machine

3.9 Finishing and Other Dyeing Section Machines

1. Sueding Machine

Brand name: Lafer

Country:Italy

Company name: SPA Machine Tessili

Drum Speed: 110 RPM

Capacity: 1500-2000 kg/shift

Fig. 3.26 Sueding Machine

2. Raising Machine

Brand: Mario Crosta

Country: Italy

Capacity: 2-2.5 tons/shift

Fig. 3.27 Raising Machine

3. Biancalani – BRIO Dryer Country:

Italy

Capacity: Upto 13 tons per day

Fig. 3.28 BRIO Dryer

4. Compactor Machine

Company name: Ferraro SPA

Made in: Italy

Speed of machine: (25-50) vary from machine to machine Controlling point:

Temperature and pressure.

Controlling system: automatic

Brand: Tube-tex

Country: USA

Model: C2500

Air – 4 bar
Speed : 0-60 yards/min (55 m/m)

Widths : 90 inch (218 cm) - 100 inch (244) cm

Fig. 3.29 Compactor Machine

5. Stenter Machine

Brand: LK & LH

Country: Taiwan

Unit: 8

Fig. 3.30 Stenter Machine

6. Dryer

Brand: Dilmenler

Country: Turkey

Speed: 4-30 m/min

Temperature: 110-220 C

No of Motor: 8
Capacity: 8 ton per day

Fig. 3.31 Dryer

7. Calendaring Machine

Brand Name: Santex ag

Company: Santex ag

Origin : Switzerland

Model: CH-9555,Tobel

Overfeed Range : -5% to +10%

Year of Manufacture: 1998

Type: Santastretch Plus-140

Max Working Speed: 80 m/min

Normal working Speed : 40~ 60 m/min

Fig. 3.32 Calendaring Machine

8. Slitting Machine

Brand: Bianco

Country: Italy

Speed: 100 m/min

Roller width: 2000 to 3600 mm

Fig. 3.33 Slitting Machine

Table 3.10 Slitting machine SOP

Fabric Type	GSM	Speed (m/min)
Single Jersey	120-150	50-55
	160-180	55-60
	180-Above	60-65
Lacoste/Pique	180-200	55
	200-Aabove	55-60
Interlock	200-240	55
	240-Above	55-60
Rib	160-200	55
	200-300	55-60
	300-Above	60
Terry/Fleece	260-300	55-60
	300-Above	55
Losse Knit/Waffle	Any	50-55

9. Dewatering Machine Brand: Santex AG

Country: Switzerland

Working width: 300-1600 mm
Total Width: WW+1.25m

Working Speed: 5-8 m/min

Compressed air supply: 6 bar

Length: 8 m

Fig. 3.34 Dewatering Machine

CHAPTER-4 RAW MATERIALS

4.1 Yarn and Thread

1. 100% cotton (20/1$_S$, 24/1$_S$, 26/1$_S$/30/1$_S$, 40/1$_S$)
2. 01% viscose + 99% cotton,
3. 15% viscose + 85% cotton,
4. 10% viscose + 90% cotton,
5. 30% viscose + 70% cotton,
6. 50% viscose + 50% cotton,
7. 30/1$_S$CVC, 30/1$_S$ PC, 75/D, 100/D, 150/D, 50/2 Sewing Thread
8. Metallic Thread

4.2 Knitted Grey Fabric

1. Single jersey,
2. Polo Pique,
3. Lacoste (Single/Double),
4. Engineering Stripe,
5. Rib &Interlock,
6. Drop needle,
7. 2/3 Thread fleece (Brushed/ Un-brushed),
8. Lycra Rib, Collar & cuff Cardigan.

4.3 Chemicals

Table 4.1 Some chemicals used in EKCL

Serial No	Name	Supplier	Type	Price
01	JINTEX KSBO	JINTEX	Wetting agent	155.40
02	WIN ACOUR RDC	N/A	Acid donor	300
03	ZINTEX RLA	JINTEX	Leveling agent (reactive)	104.60
04	ZETAFIX WER	ZSCHIMMER & SCHWARZ	Fixing agent	155.03
05	JINTEXYECO SQ-117	JINTEX	Sequestering agent	101.27
06	NEUCOBLANC-2013	TM CHAMICALS	Leveling agent (reactive)	143.55
07	WSS	ELITTE TEXTILE	Emulsifier	163.10
08	ABLUTEX BBV	ABLU	Washing agent	197.62
09	MEROPAN-CIT	CHT	Acid donor	184.00
10	RACTOCALL PL7X	H&M LTD	Anti-pilling enzyme	0.00
11	LORINOL ULTRA-125	N/A	Peroxide killer	170.00
12	SITAVIN AS	N/A	General chemicals	93.77
13	STAIN REMOVER	N/A	Washing agent	850.00
14	ABLUTEX STR	ABLU	Leveling agent	106.47
15	HDL-160	ABLU	Anti-pilling agent	372.40
16	SETAMOL BL	BASF	Dispersing agent	0.00

17	SILTEX ASILONOL	CRECOON PVL LTD (PAK)	Enzyme Killer	175.00
18	GLAUBER SALT	GRASSIM INDS LTD.	General Chemical	22.78
19	SARABID-OL	CHT	Leveling agent (Disperse)	262.13
20	HYDROGEN PER OXDIE (50%)	CENTARY FAITH	General Chemical	66.29
21	JINSOFT-AW-509	JINTEX	Softener	120.00
22	HYDROS	NIMIR CHEMIC	General Chemical	164.00
23	SODA ASH	N/A	General Chemical	40.63
24	ESTABICAR OR	JINTEX	Stabilizer	71.86
25	ASUMIN C	ABLU	Softener	20.21

Chapter-5 PRODUCTION PLANNING, SEQUENCES AND OPERTAIONS

5.1 Planning Department

Production planning is an integrative process of coordinating the demand for finished goods with available resources. Production planners may work many months ahead of planned delivery to ensure that specific materials, production capacity and reliable quantity management are available when needed. Long-term production planning (months or selling periods) is based on forecasts, merchandise plans and budgets; short-term production planning (days or weeks) is based on customer.

Esquire uses short-term production planning for plant level relates required production times for styles on order (production standards) with available production time in the plant. Style specifications and sample supplied by technical designer describe the sequence of operations, materials to be used, special skill, handling procedures and quality requirements demanded for production. Production planning involves coordinating plant capacity with style requirements, projected volume and shipping date. Coordinating a plant's resources and activates requires teamwork and an integration of operating system. Esquire planning department works based on two principles-

- No line gap
- On time shipment

Fig. 5.1 Fast React (Esquire's Planning Software)

5.1.1 Workflow of Planning Department

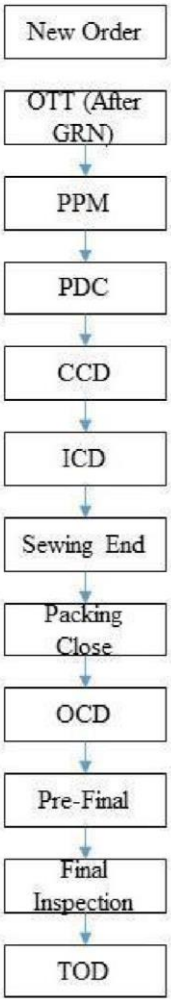


Fig. 5.2 Workflow of planning department

On or before OTT:

- All grading must be approved by buyer
- All sewing accessories must be in-housed
- Across all color fabrics must be in-housed **On or Before PPM:**
- Sample approve with all actual accessories
- Size set must ready by production department
- Finishing accessories such as carton, poly, back board etc. must confirm by QA Dept.
- Bulk approval must confirm **On or before PCD:**

- Bulk cutting start **On or before sewing input:**
- All finishing materials must be in-housed **On or before CCD:**
- Cutting must complete 2.5 days before ICD
- Recut
- Cutting Forecast **On or before ICD:**
- ICD must hit 2 days before the sewing end (would vary for short quantity order) **On or before Packing Close:**
- All goods must be packed and handed over to carton section.

On or before OCD:

- Garments must be carton close and carton audit pass.

On or before TOD:

- Good must be ex-factory.

5.1.2 Job Description of Planning Coordinator

1. OTT status follow up:

- Accessories status : (must)
- Fabric status
- Partially in housed materials follow up (Must)

2. Pre-production activities:

- job card /marker release, trim card collection for pilot cutting.(Support)
- size set cutting and stitching follow up: (Support)
- Pre-production meeting arrangement- including room booking, calling people to attend by phone mail or in person. (Must)

3. Input Follow up:

- Ensuring 2.5 days WIP in line and 2 days in WIP cutting. (Support)
- Ensuring ratio wise input and transfer. (Support)
- Inform cut planner to change plan according to the requirement of line
- Prioritize cutting as required. (Must)
- Arranging recut and additional materials as required. ((Support and communication Must)
- Communicating with merchant for over purchase. (Communication Must)

4. **Reconciliation:**

- Partial/short shipment reconciliation. (Support)
- Over purchase reconciliation. (Support and communication Must)
- Justify system data by cross checking with responsible personnel. (ERP data should be accurate; lack of which is causing to run here and there for the correct information ending with data approximation).
- Taking signature from all the HODs.(Must)

5. **Reports:**

- Production status report follow up.(Must)
- Export status reports follow up.(Must)
- Daily/Weekly OCD, PCD, OTT status report maintain (Must)

6. **Export follow up:**

- OTD status monitoring.(Must)
- Predicting possible inspection and export date.(Must)
- Resolving last minute issues like recut balance, additional material arranging including mail sending, calling and requesting merchandiser and material control.(Must)
- Follow up all changes in export and uploading involved personnel (Must)
- Overall follow up all processes for problematic style/PO.(Support and Communication) (Must)

7. **Plan Analysis**
8. **Updating Planner, Unit Manager/ Operation Manager with any required information.**

5.2 Sample Department

Sampling process in the apparel industry is an important activity for the order acceptance. It represents the industry in front of buyer. The main purposes of sampling process are

- To allow the buyer to judge the production capabilities of the manufacturer.
- To provide a means for making revisions in the bulk production process.
- To let the manufacturer estimate the thread and fabric consumption and develop cost quotation.

Since buyer places order after getting satisfied with the quality of sample, this process is considered a vital one. Skilled worker generally performs the sampling process by a separate department in garment industry. Merchandiser is the person who co-ordinates with the buyer and sampling department. There should be no compromise in making sample.

The sampling process is a milestone activity in order confirmation. Its acts a decisionmaking process in apparel industry, there will not be any compromise in sample development process. The company spend a quantum of the amount to develop the sample.

Esquire Knit Composite Ltd. has well equipped sample section. They can produce any type of sample as per buyer requirement.

5.2.1 Sample Section Overview

Table 5.1 Sample Section Overview

Total floor space	17500 sq. ft.
Total manpower	200
Sample Making Line	2
Pilot run line	3
Total Sewing machine	150
Daily sample capacity	150

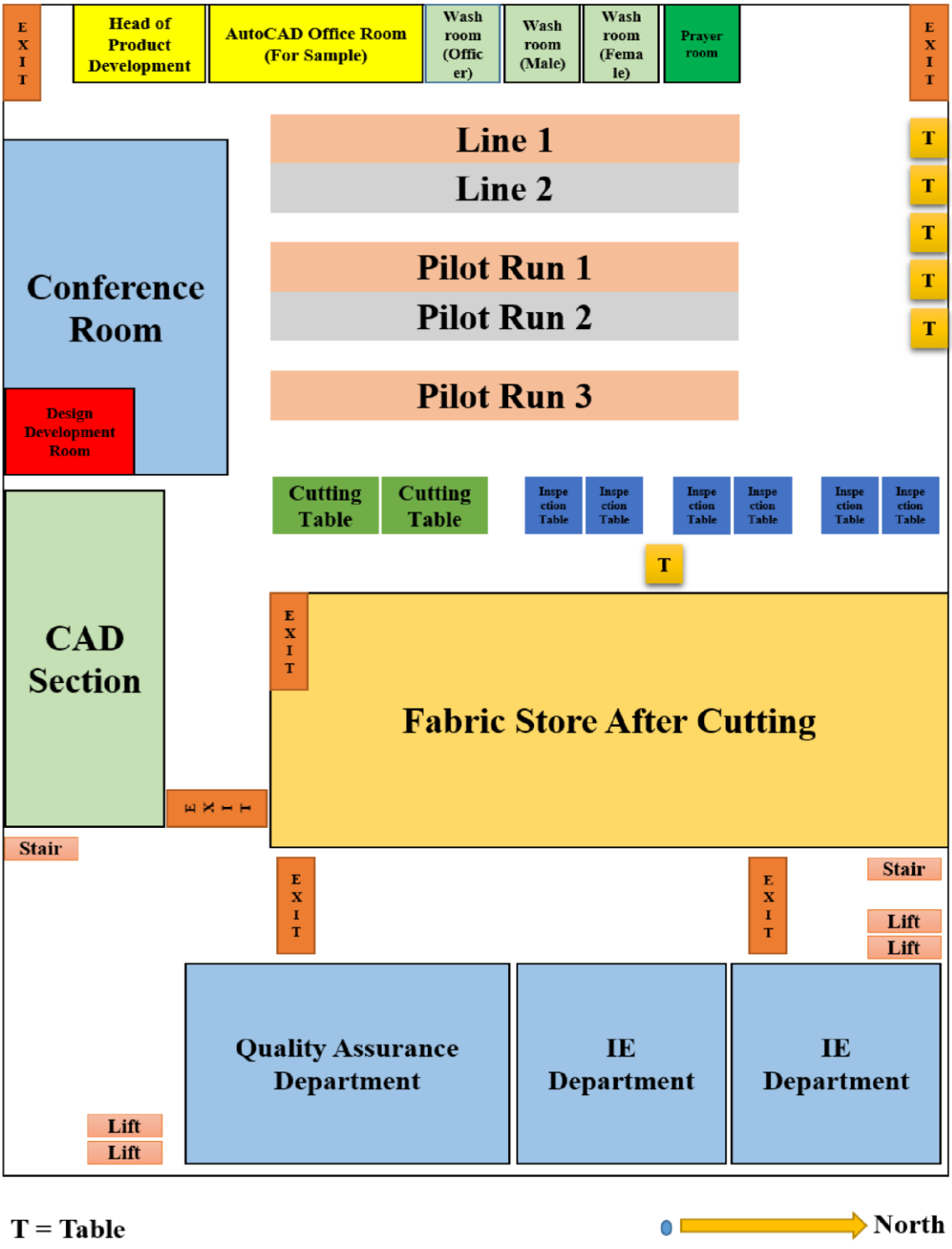


Fig. 5.3 Sample section layout

5.2.2 Workflow of Sample Department

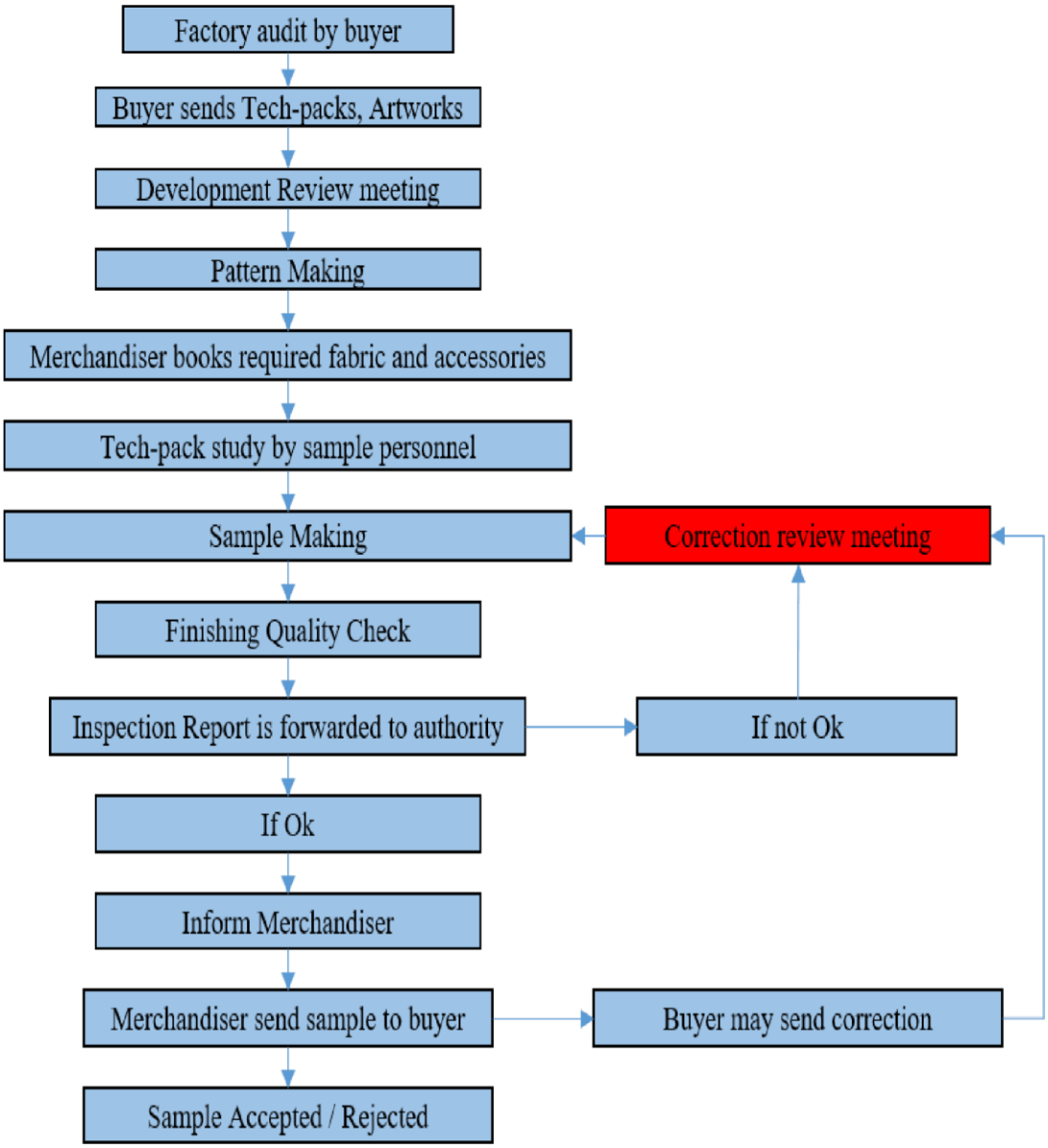


Fig. 5.4 Workflow of sample department

5.2.4 Sample Development Process

There are three distinctive phase of sampling process; the first phase covers the development of the initial concept design and approval. The second phase covers the process of prototyping, sourcing and ordering, trialing. The third phase includes range of activities that are carried out before large scale or bulk production.

- New buyer audits the factory at the very beginning.
- If buyer is satisfied then he/she sends merchandiser Tech-pack/Artwork of about 2030 different styles.
- Merchandiser gives it to sample department and a review meeting is arranged for sample making.

- Pattern is made by hand or CAD system for sample making.
- Merchandiser books required fabric & accessories for sample making.
- Sample personnel study the tech-packs for sample making.
- Each sample-man makes 2-3 samples.
- Within 3-4 days, required samples are prepared.
- Quality of samples are checked by sample quality controller.
- After finishing quality, check a quality report is submitted to higher authority.
- If the sample quality report is ok then merchandiser is informed that sample is ready.
- If there is problem in quality report about sample a review meeting is called to rectify the problem or fault.
- Merchandiser sends samples to buyer.
- Buyer may accept or reject sample based on the quality of sample. One buyer ask samples from many factories at the same time. Therefore, quality should be given the highest priority during sample development.
- Buyer may send some correction for sample to merchandiser. Then again a review meeting is called in response to buyers correction issues.

5.2.5 Sample Department Facilities

- CAD system
- Manual pattern development
- Automatic pattern development

CAD system: CAD means Computer Aided Design. The design which make by computer with the help of digitizer is called Computer Aided Design (CAD). The CAD can be 3D or 2D in Esquire ltd. is used. Software used in CAD section

- **Optitex**
- **Lectra**
    - Pattern: Modaris.
    - Marker: Diamino modaris.

Manual pattern development: Esquire can develop pattern manually. They have skilled personnel for this job.

Automatic pattern development: Esquire has Winda pattern cutting machine by which they can cut pattern completely automatically.

5.2.6 Types of Sample

Esquire is capable of producing any types of sample. Samples they usually produce are listed below-

Developed Sample:

- The first sample developed by the company based on the buyers requirement.
- The sample generally used to produce to assess the look and take a decision on the sample whether to proceed or decline the particular style out of the line.
- Developed sample needs to be submitted within 45 days from the first communication.

Proto Sample

- Based on the comments from the development sample, the proto sample is developed.
- The proto sample is the sample where the company submits the requirement using exactly the same fabric and trims or available fabric.
- The merchandiser needs to submit at least 4-6 samples based on the buyer requirement. If correction received, they need to resubmit the proto sample.

Fit Sample

- A fit sample is used to evaluate the garment fit against a dummy or live model.
- This sample needs to be submitted by merchandiser within 7-10 days.
- Fit sample is prepared based on one size (mainly basic size).

Size Set Sample

- To check the fitness of the sample, size wise size set samples are asked.
- Hence, 2-3 garments in all the size are prepared with original or proximate fabric to send to the buyer.
- Once the buyer is satisfied they seal the garment and send it to the garment manufacturer as a symbol of understanding between them that they are satisfied with the product and want the manufacturer to make this product only in the bulk.

These samples are called "**Red sealed sample**" and they are often used at final inspection stage. **Photo sample**

- These samples are requested only if buyer is in need of samples to promote their styles in medis like TV ads, promotional clippings catalogues,etc.

- Thes samples are sent based on the requests from the buyer. **Sales man sample**
- The main purpose is to display the next season styles in the current season to get the feedback from the customers.
- These samples are also used to get orders from the retailers.
- Usually 40 pcs the color is sent to buyer as sales man sample and buyer pays about 3 times of actual product for sales man sample.

Pre –production saple

- Pre-production sample are the pilot run sample,before starting the production;the sample is prepared with the orginal fabricc and all actual requirements.
- Acceptance of this sample encourages the factory to start the bulk manufacturing of the goods.

Production Sample

- Once production is going on a few sample garments are taken in the middle of the production. The purpose to send the production sample to the buyer when production is online being to inspect that the garments are being manufactured as per the approval and decided specifications.
- This sample is also termed as "**Gold sealed sample**" by some buyers. without gold seal sample approval, the shipment or final inspection cannot be done.

There are also many other samples prepared as per buyer requirement such as Strike-off sample, Counter sample, GPT sample, Shipment sample, Wash sample.

5.3 Pattern and Marker Making

Esquire has its own designing department for various garment styles. The CAD department is accountable for the following functions:

- Determining cutting average for costing
- Making the most efficient cutting marker
- Development and alteration of patterns
- Development of size set pattern by grading
- Digitizing the pattern

5.3.1 Workflow diagram of CAD section

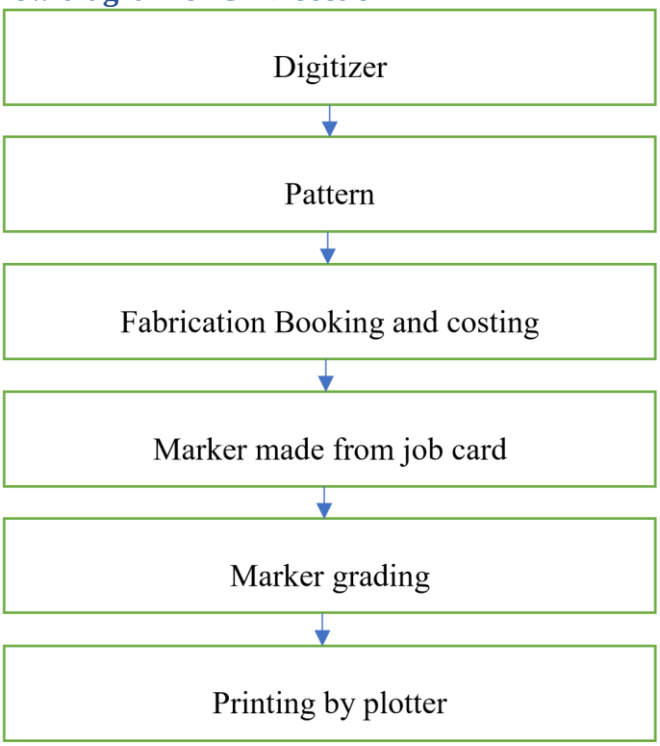


Fig. 5.5 Workflow diagram of CAD section

5.3.2 Digitizer

Pattern can be made both by "Modaris" directly or from another pattern by digitizer board. A digitizer contains normally a white board on which the pattern is placed and a mouse type device by which point is taken from pattern paper.

Fig. 5.6 Digitizer

Digitizer using commands:

1. New Sheet – 0
2. Grain line – CF

3. Corner – 2
4. Shape – C
5. Cut mark – 6
6. Last point (End) – F
7. Fully End – FF

After taking reading from the pattern, some editing and rectification is done to get the accurate and exact pattern dimension.

5.3.3 Marker making

After the completion of pattern making in “Modaris”, pattern is sent to “Diamino” software for making marker according to the cut order ration mentioned in the job card. When marker making is completed then it is printed out by plotter.

5.4 Spreading

Spreading is the process of superimposing length of fabric on a spreading table cutting table or specially designed surface in preparation for the cutting process. A spread or lay-up is the total amount of fabric prepared for a single marker. A may consist of a single ply or multiple plies. The height of the lay up or spread is limited by fabric characteristics, size of the order to be cut, cutting method and vertical capacity of the spreader. In Esquire, usual fabric lay height is up to 3.5 inches.

5.4.1 Methods of Spreading

Esquire has both manual and automatic spreading facilities. Manual spreading is done here for yarn dyed fabrics (check/stripe) and automatic spreading is done for solid dyed fabric. In case of the manual spreading process, two persons are normally required except when the spread is too short. One person on

each side of the spreading table could work during spreading to keep the fabric flat, smooth and tension-free. With the automatic spreading process, the equipment itself controls the fabric tension, fabric placement and rate of travel.

a **b**

Fig. 5.7 a) Manual spreading b) Automatic spreading

Table 5.2 Esquire's Spreading Machines SOP Parameter

Fabric Name	Fabric Composition	GSM	Max ply	Max usable length yds.	Lay Speed of the Spreader (meter/min)		
			No. of ply		Min	Max	Avg.
Single Jersey	100% Cotton	Up to 120	140	10	10	30	20
		102-140	140	12	10	40	30
		140-170	110	12	20	50	40
		170-200	100	14	30	60	45
		200-220	90	14	30	60	45

		220 Above	80	14	40	60	50
Single Jersey	95% Cotton 5% Lycra	Up to 140	80	8	10	25	18
		140-170	80	9	10	30	22
		170-220	80	9	10	30	25
Single Lacoste	100% Cotton	Up To 180	100	14	20	50	35
	95% Cotton 5% Lycra	200 above	70	9	10	40	30
1×1 Rib	100% Cotton	Up to 160	110	10	20	50	40

Interlock	100% Cotton	160-190	100	12	30	60	45
Pique		190-220	90	12	30	65	50
	100% Cotton	220-260	75	12	30	65	55
		260 above	70	12	30	65	55

2×2, 2×1, 3×2 Rib	100% Cotton	Up to 160	80	7	10	30	20
		160-190	80	8	15	35	25
		190-220	70	8	20	45	35
		220 Above	60	8	20	45	35
Fleece/with inside brush/ &CVC	100% Cotton	Up to 200	70	9	20	50	35
		200-240	60	9	25	55	40
		240 Above	50	9	30	60	45
Terry	100% Cotton	Up to 200	75	9	20	50	35
		200-300	65	9	25	60	45
Viscose Single Jersey/PVC Single Jersey	95% Viscose 5% Lycra	Up to 140	80	9	30	60	45
		140-200	60	7	10	25	18
		200 Above	50	8	15	30	22

Mesh	100% Polyester	Up to 160	50	8	15	30	22

5.4.2 Fabric Control during Spreading

Preferably, each ply in the lay should be spread by superimposing the fabrics one above another with their ends aligned.

- Smoothing fabric – During spreading it is important to open out any unnecessary folds, and to avoid 'bubbles' caused by uneven tension in softer fabrics.
- Skewing – Skewing is a condition where the fabric is angled across the course.
- Bowing – Bowing is created when the cross-grain weft bends additionally down the table in the center of the fabric which is difficult to minimize.

5.4.3 Avoidance of Distortion in the Spread

Spreaders are vital to lay up the fabric without any tension. Therefore, the garment panels do not shrink after cutting. Normally, a glazed paper with its glossy side kept down is put at the top of the spreading table before spreading to avoid disturbance of lower plies of fabric while the base plate of a straight knife cutting equipment passes beneath it.

5.4.4 Elimination of the Fabric Faults

The fundamental ways of taking action to localized faults are:

- Make-through system
- Cut out at the lay
- Sort and recut system.

Esquire use sort and recut system for removing fabric faults. In the case of the sort and recut method, the fabric faults are marked with a strip of contrasting fabric; however, no action is taken at the spreading stage. After the cutting process is completed, the cut components are inspected for faults and the defective panels are recut from the remnant fabric. This is a cost-effective method and is particularly used when the cost of fabric is high, the garment pieces are large and the fault rate is high.

5.4.5 Fabric Relaxation

Fabric relaxation is very important for some kinds of fabrics to release tension of the layers. If the layers contain improper (too much or too less) tension in the lay then it will affect the ultimate garments quality especially in the measurement and shapes.

Table 5.3 Esquire's Fabric Relaxation SOP

Fabric Type	Minimum Relax Hours
100% Cotton S/J + H/J, Terry, Fleece	8 hrs.
95% Cotton 5% Elastane, S/J + H/S	24 hrs.
90% Cotton 10% Viscose	24 hrs.
60% Cotton 40% Polyester, S/J + H/J	24 hrs.
100% Cotton 1×1,2×2,3×2 Rib	12 hrs.
100% Polyester Rib	24 hrs.
95% Viscose 5% Elastane	48 hrs.
60% Polyester 40% Viscose S/J + H/J	24 hrs.
100% Polyester, Interlock	24 hrs.
60% Cotton 40% Polyester, CVC fleece	24 hrs.
100% Polyestere, Mesh	48 hrs.

CVC, Pique, Lacoste	24 hrs.
96% Cotton 4% Elastane, S/Lacoste	24 hrs.

Fig. 5.8 Relaxed fabric on rack

5.5 Cutting

Cutting is the preproduction process of separating a spread into garments parts that are the precise size and shape of the pattern pieces on a marker. The cutting process may also involve transferring marks and notches from the marker to garment parts to assist operators in sewing. Chopping or sectioning a spread into blocks of piece goods may precede precision cutting of individual pattern shapes. There are some factors, which affect the cutting process-

- Nature of fabric (grain line shade, twill etc.) Thickness of fabric.
- Design characteristics of finished garment.
- Machines and tables used.

The four main operations or processes involved in the cutting section are

- Marker planning
- Fabric spreading
- Fabric cutting
- Preparation for the assembling process

5.5.1 Cutting Section Overview

Table 5.4 Cutting section overview

Automatic spreading machine	06
Automatic cutting machine	03
Straight Knife	18
Per day capacity of cutting section	100000 pcs (200000 tons) approximate
Total Worker	200

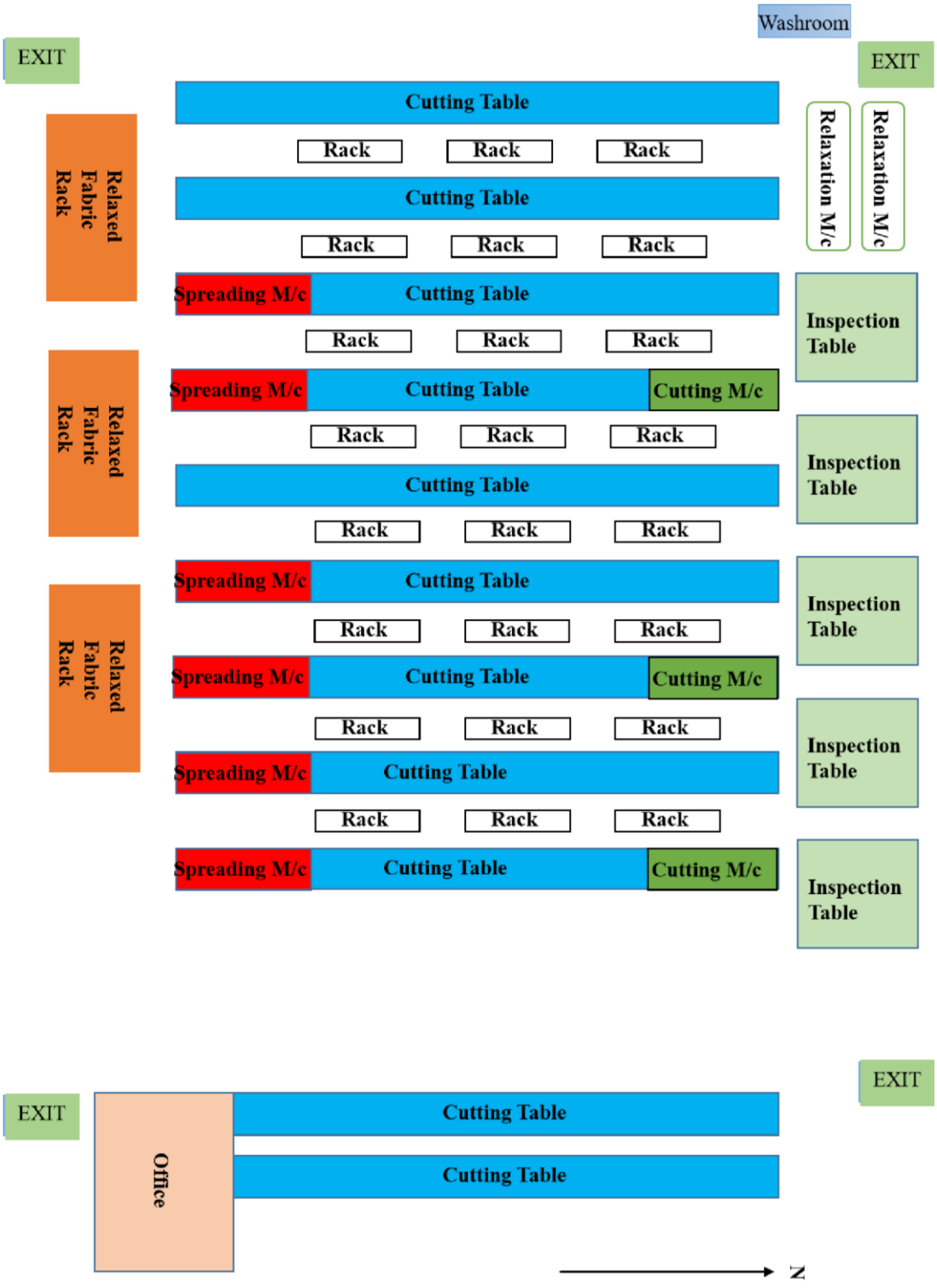


Fig. 5.9 Cutting section layout

5.5.2 Workflow of Cutting Department

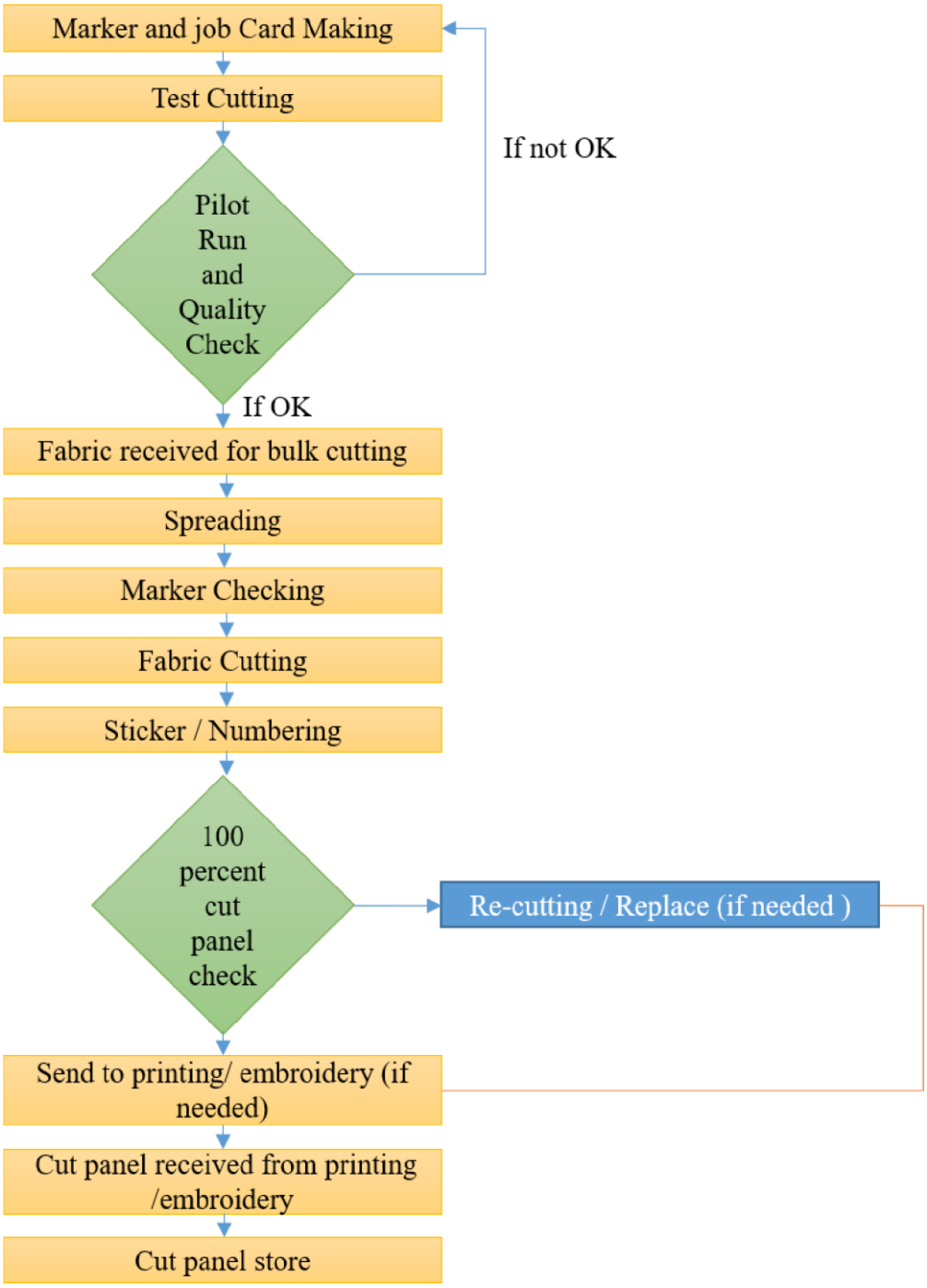


Fig. 5.10 Workflow of cutting department

5.5.3 Methods of Cutting

Cutting can be done both in manual and computerized method. Generally, manual cutting is done for yarn dyed fabric for matching checks or stripes among the cut panels and computerized cutting is done for solid dyed fabric. In manual method, hand operated scissor, round knife, straight knife, band knife are used in Esquire. Esquire has three computerized cutting machines also which can cut fabric by knife.

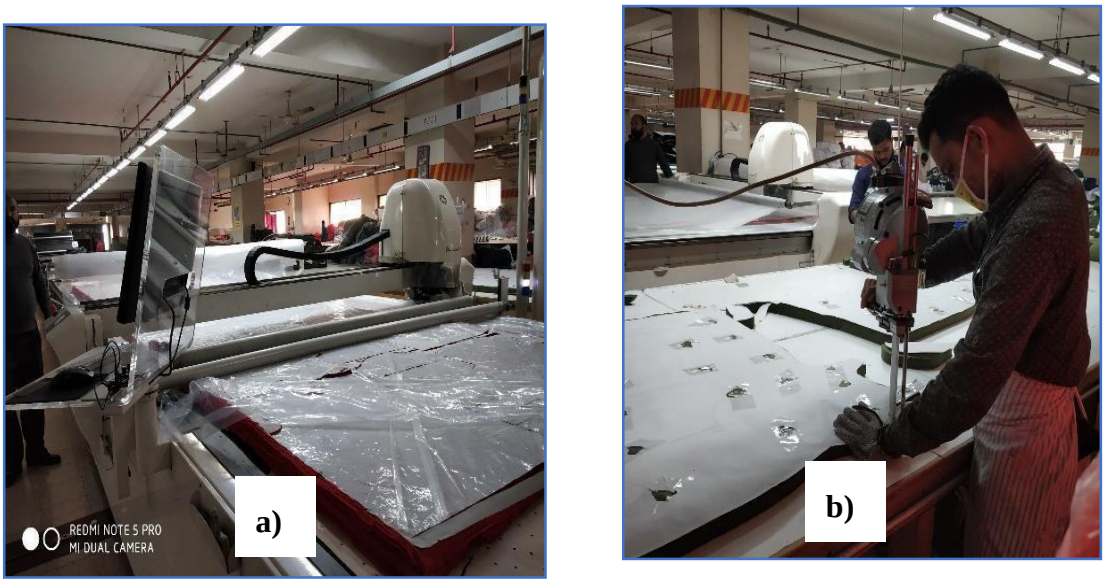


Fig. 5.11 a) Computerized cutting b) Manual cutting

After the spreading process is completed, the marker is kept on top of the spread. The beginning line in the marker is aligned at the starting point of the spread. The spreader has to ensure that the length and width of the spread matches with the length and width of the marker. For attaching the marker with the fabric lay Straight T-pins, gum tape are used.

5.5.4 Preparation of Cut Work for Sewing Room

The essential preparatory activities for sewing are bundling, shade separation, indicating the face side of the fabrics and work ticketing.

Bundling: Most of the sewing rooms use the bundling system, where small batches of garments move from one workstation to another in a controlled manner. In order to prepare the cut work, it is essential for operators to be able to identify each pile. This is the function of the marker, if used, as the style number, the size and the part identification will be part of the plot. If markers are not used, a top-ply labelling system is required.

Shade Separation: Shade variation in fabric roll is common. However, within the batch of cut components, there are likely to be shade differences. It can be ensured in cutting sections by inserting tissue paper between every piece. With quality outerwear garments, it is quite common to give every garment piece a pressure-sensitive adhesive ticket with a ply number known as soabaring.

Indication of the Face Side of Fabrics:

Few fabrics have a noticeable difference between the face and back, which does not pose any problem for machinists to identify it. However, the fabrics that are identical on both sides pose a problem. The need for identification of face side becomes crucial when there is a close resemblance between the face and the back side of the fabric. Right side identification may use soabar tickets, whereby the ply number is always positioned on the fabric face.

Work Ticketing: Whenever the bundling system is used, it should be accompanied by work tickets or bundle tickets. It gives fundamental information about the work such as the style number, the size of the garment, the number of garments in the bundle and the date issued. Work tickets are usually created on site once the outcome of spreading/cutting is known.

After doing all sorts of stuffs, cut panels are store in input store room.

5.6 Sewing Section

Esquire uses straight line production system in their garments floor. This kind of production system is based on a harmonized or synchronized flow of work in each stage of the garment production process. There are 54 lines in total in Esquire. These line are categorized as –

- Basic: SMV 12 or less than 12.
- Critical: SMV greater than 12 but less than 20.
- Hard: SMV above 20

Basic, critical and hard lines contain 30, 42 and 50 operator consecutively.

5.6.1 Workflow of Sewing Section

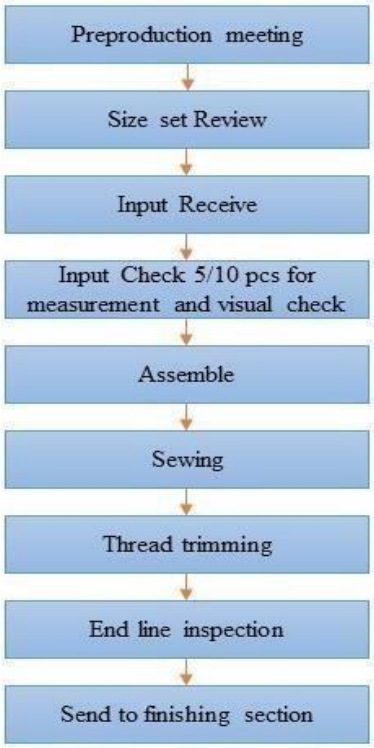


Fig. 5.12 Workflow of sewing section

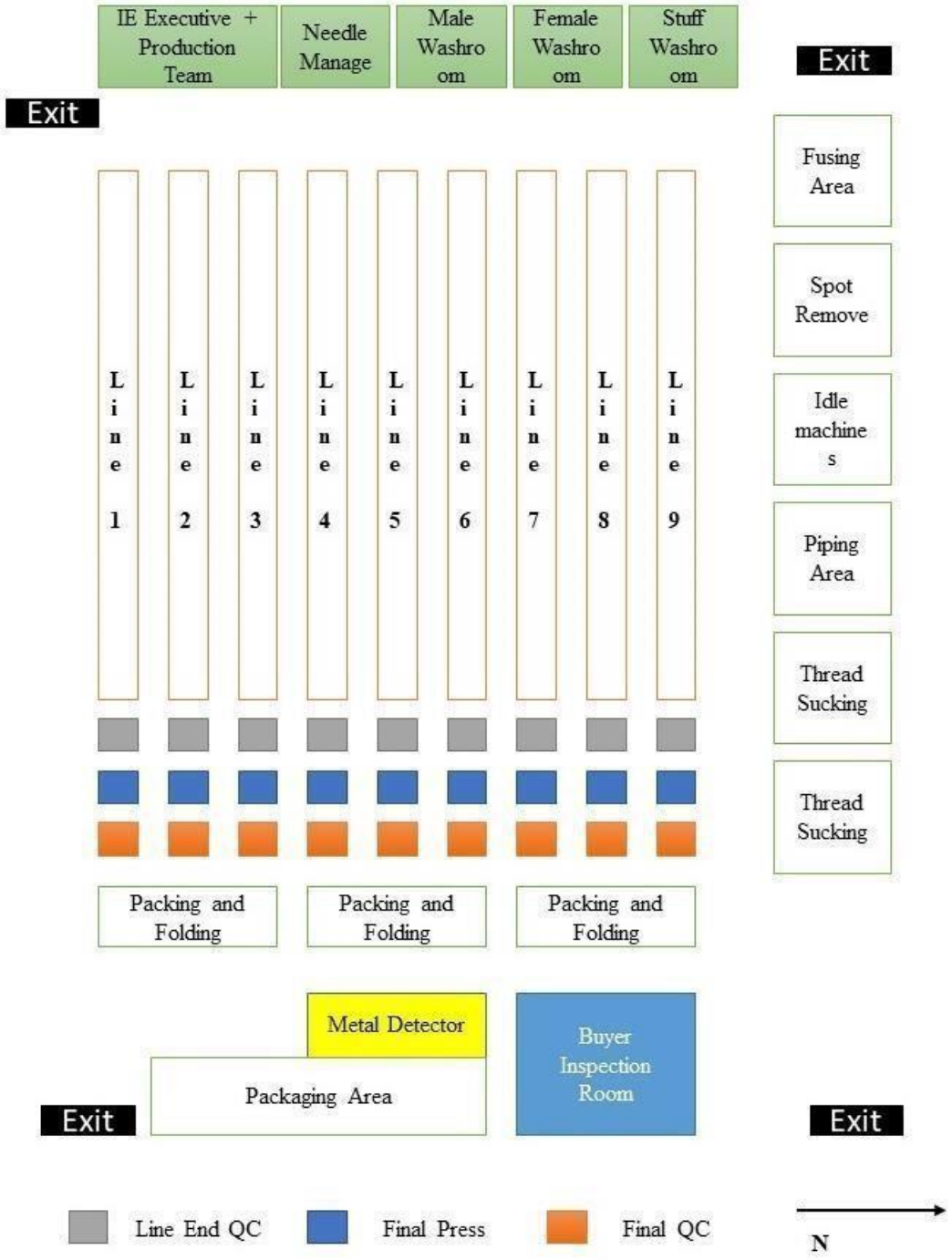


Fig. 5.13 Sewing section layout

Fig. 5.14 Sewing floor (Unit 4)

5.6.2 Fusing

During garment manufacturing process, many times we need to use interlinings in different parts of the garments. Knit fabric garments use fusible interlining almost every time. Esquire Knit Composite use their own SOP for attaching fusible interlining with fabric panels.

Table 5.5 Temperature variations for fabric of fusing machine

NAME OF THE FABRIC	FABRIC GSM	STD. TEMP.	STD. PRESSURE	STD. RPM
MICRO+POLYSTER	220	155℃	5KG	11RPM
COTTON 1X1 RIB- Y/D	220	158℃	5KG	10RPM
S/J LYCRA ALOVER	180	162℃	5KG	12RPM
INTERLOCK SOLIT	220	165℃	5KG	12RPM

COTTON S/J Y/D	200	134℃	5KG	09RPM
PIQUE COTTON- Y/D	220	148℃	5KG	09RPM
COTTON S/J Y/D	220	154℃	5KG	11RPM

TERRY FLEECE ALOVER	240	170℃	5KG	13RPM
COTTON 2X2 RIB- Y/D	240	168℃	5KG	12RPM
LYCRA 1X1 RIB	280	175℃	5KG	13RPM
LYCRA 2X2 RIB	320	180℃	5KG	14RPM
COTTON S/J Y/D	220	140℃	5KG	10RPM
LYCRA S/J	180	135℃	5KG	09RPM
COTTON S/J	220	130℃	5KG	09RPM

VISCOSE	200	130°C	5KG	09RPM
COTTON S/J Y/D	200	140°C	5KG	10RPM
TWILL	300	163°C	5KG	12RPM
COTTON S/J Y/D	210	144°C	5KG	10RPM
COTTON 1X1 RIB- Y/D	200	148°C	5KG	10RPM
PIQUE COTTON- Y/D	220	158°C	5KG	09RPM
COTTON S/J Y/D	220	160°C	5KG	10RPM
COTTON S/J Y/D	250	165°C	5KG	08RPM
COTTON INTERLOCK	220	140°C	5KG	08RPM
CHERRY FLEECE	245	162°C	5KG	08RPM

COTTON S/J	220	130℃	5KG	12RPM

5.7 Garments Finishing

The finishing department is the last section in the garment production prior to packing and dispatch and it plays a significant role in the final garment appearance. It involves the following processes: trimming, inspection, pressing, tagging section, packing.

5.7.1 Workflow of garments finishing section

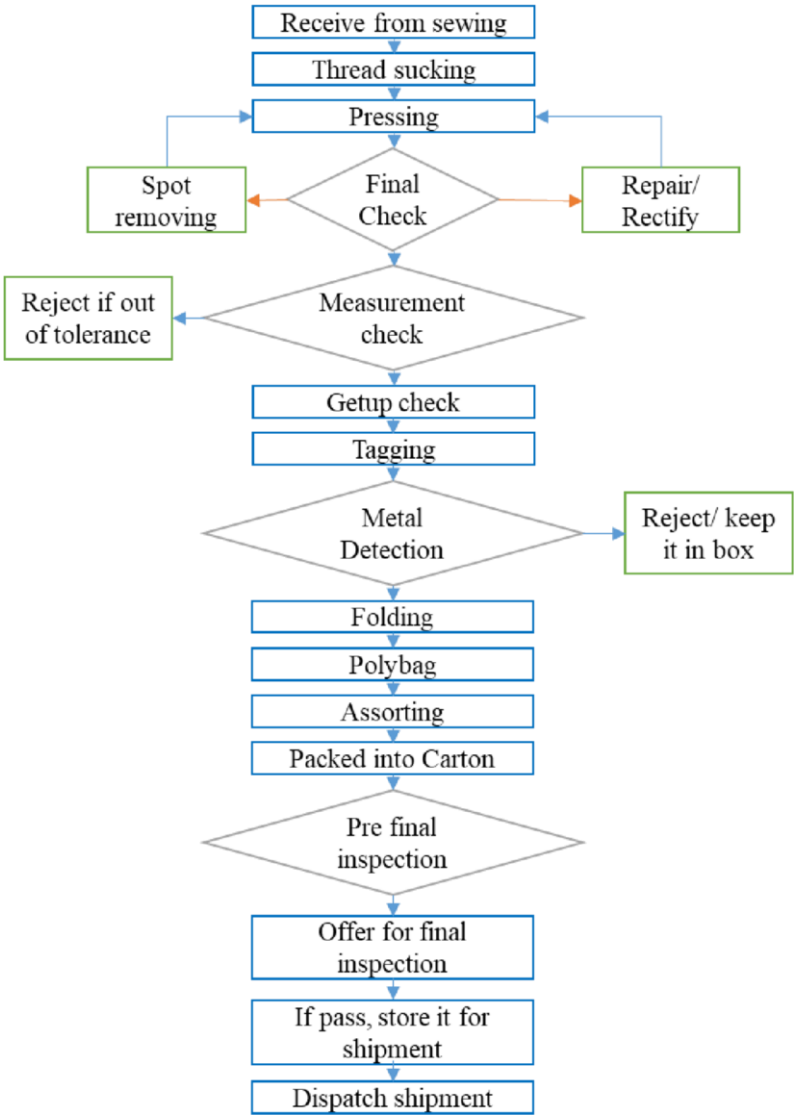


Fig. 5.15 Workflow of garments finishing section

5.7.2 Thread Sucking

When a garment comes out of the sewing line, it contains good amount of sewing thread cuttings with it. Before doing pressing, all these extra threads should be removed from each and every garment. For removing threads, thread sucking machine is used which sucks the thread due to the negative pressure created inside it.

Fig. 5.16 Thread sucking process

5.7.3 Pressing

It is the process of application of heat, pressure and moisture to shape or crease garments or garment components into the geometric forms proposed by the designer. The pressing process influences the final garment appearance and hence the garment appeal. Finishing and pressing machines contour the semi-finished garment panels as well as finished garments by bringing down the fibres in the fabric to an elastic state and then deforming and setting them.

5.7.4 Purpose of Pressing

- To flatten out the undesirable wrinkles, creases and crush marks.
- To make creases where the garment design needs it.
- To mould the garment to the silhouette of the body.
- To prepare garments for further sewing.
- To refinish the garment after completion of the production process.

5.7.5 Pressing Equipment (Steam Iron)

In-house hold operations, normal electric irons are extensively used. But today steam irons are used for industrial purposes. In stem iron, the iron is heated up by steam which is

supplied from a central boiler or a mini boiler. The supply of steam is regulated by a hand regulated button. This steam is supplied to iron from the boiler through a pipe and let to come out through perforations under the iron. These irons are triangular in shape and their weight varies from 1 to 15kg. For pressing this iron, ironing bed or table is required. With the bed there should be a provision of air suction system. After ironing, a foot regulated switch is pressed for air suctioning which removes the moisture and heat as well from the pressed garment quickly. To operate steam iron, skilled and experienced operator is required.

5.7.6 Spot Removing

Due to various types of handling garments gain some spot of oil, ink on it. They must be removed before final inspection.

Rustgo JJW-833 (Spot lifter):

- Formulated without chlorinated solvents to meet today's factory standards and fabrics requirements.
- Guaranteed to leave no stains or rings.
- Removes grease and oil stains safely from wool, cotton, silk, corduory, dacron, nylon, orlon and other synthetic materials.
- Will remove grass stains and most food spots, too.

Acetone:

- Used to remove ink stain from garments.

5.7.7 Metal Detection

Any garments should not be packed without metal detection. Metal detections operating procedure:

- Metal detection should be done twice.
- Second time garment will rotate in opposite direction turned in 90° angle.
- Keep enough space between two garments.
- Avoid overlapping the garments.

If metal is detected the following steps should be followed:

- Step 1: If metal is detected, keep it in a box for verifying.
- Step 2: Inform the manager.
- Step 3: In presence of manager, check the those metal detected garments one by one in metal detector machine.
- Step 4: In metal is detected, keep it on a wooden table and search for metal in the garment by hand metal detector.
- Step 5: If metal is not found, keep the garment in red seal box.
- Step 6: If metal is found, remove it and go to step 3.
- Step 7: Manager should verify that no metal is present in the garment.

Fig. 5.17 Hand Needle Detector

5.8 Packaging

This is the final process in the production of garments, which prepares the finished merchandise for delivery to the customer. These operations come under the materials handling methods and are no less important than other systems used in the factory. After completing the entire manufacturing task, apparel is required to be packed. After packing, it is placed in cartons as per instructions and then it is stored in a store section before it is delivered to the respective buyer.

5.8.1 Packaging materials Packaging

Materials that are used –

- Paper
- Cardboard
- Tissue paper
- Carton box

- Insert card
- Barcode sticker
- Size sticker
- Tag bullet
- Gum tape
- Plastic strap
- Strap machine
- Cord
- Hanger
- Polybag
- Silica gel □in etc.

Fig. 5.18 Strapping machine

5.8.2 Types of packing and folding

There are four types of packing and folding for shirts, they are mentioned below:

Standup pack: In which collar is folded and kept at 90°C angles with the body.

Semi-standup pack: In which collar is folded and kept at 45°C angles with the body.

Flat pack: In which collar is folded and completely laid flattened on the body.

Hanger pack: In which shirt is supplied in box by hanging on a hanger.

5.9 Printing

Printing is the process by which we apply color on specific area using dye or pigment in definite patterns or designs. In properly printed fabrics the color is bonded with the fiber, so as to resist

washing and friction. Textile printing is related to dyeing but , here as in dyeing proper the whole fabric is uniformly covered with one color ,in printing one or more colors are applied to it in certain parts only, and in sharply defined patterns.

In printing , wooden blocks, stencils ,engraved plates ,rollers ,or silk screens are used to place colors on the fabric. Colorants used in printing contain dyes thickened to prevent the color from spreading by capillary attraction beyond the limits of the pattern or design.

5.9.1 Different types of printing

- Pigment
- Discharge
- Rubber
- Puff
- Glitter
- Metal
- Foil
- Flock
- Vinyl
- Stone
- Sublimation
- Engraving
- Emboss
- High density
- Gel
- Silicon
- Seam seal
- Crack
- Stud
- Burnout

5.9.2 Workflow of Printing Department

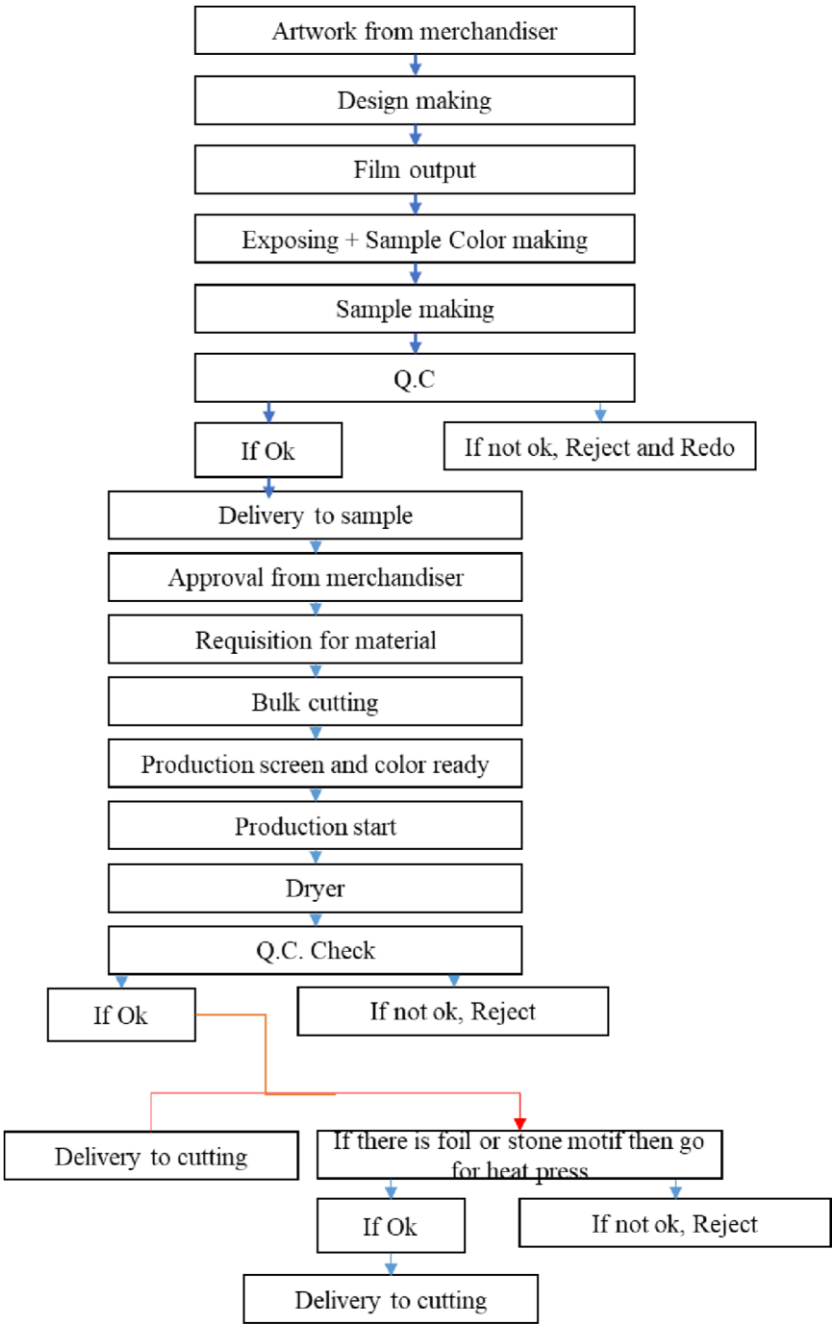
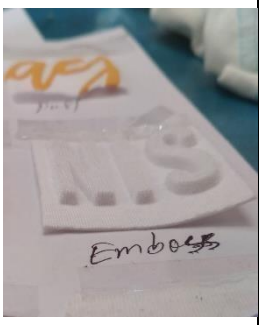


Fig. 5.19 Workflow of printing department

5.9.3 Different Printing Images



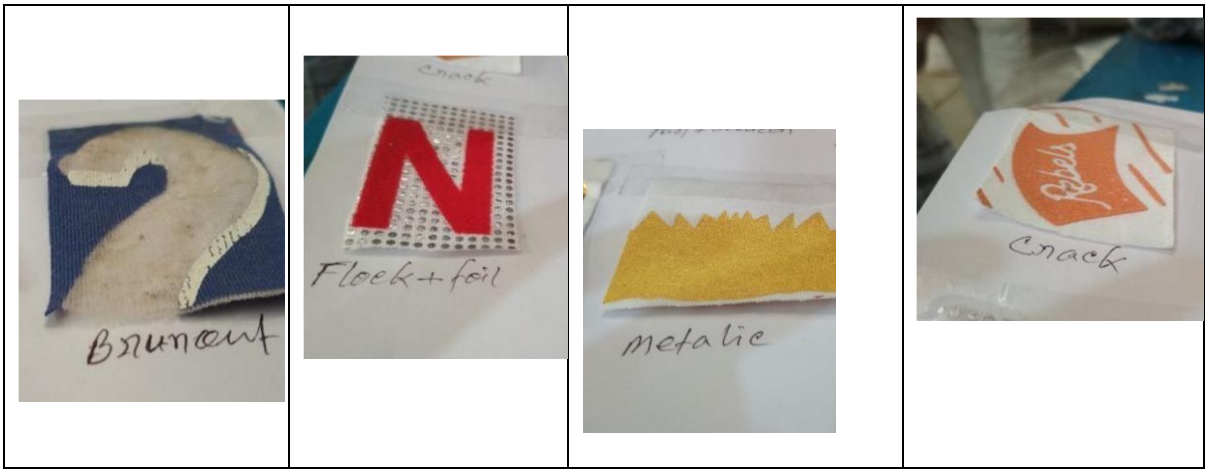


Fig. 5.20 Different printing

5.10 Embroidery

Embroidery is the art or handicraft of decorating fabric or other materials with needle and thread or yarn. Embroidery may also incorporate other materials such as metal strips ,pearls ,beads, quills ,and sequins .A characteristic of embroidery is that the basic techniques or stitches of the earliest work—chain stitch, button hole or blanket stitch, running stitch, satin stitch, cross stitch—remain the fundamental techniques of hand embroidery today.

Machine embroidery, arising in the early stages of the Industrial Revolution, mimics hand embroidery ,especially in the use of chain stitches ,but the" satin stitch" and hemming stitches of machine work rely on the use of multiple threads and resemble hand work in their appearance, not their construction .

Fig. 5.21 Embroidery section

5.10.1 Workflow of Embroidery Department

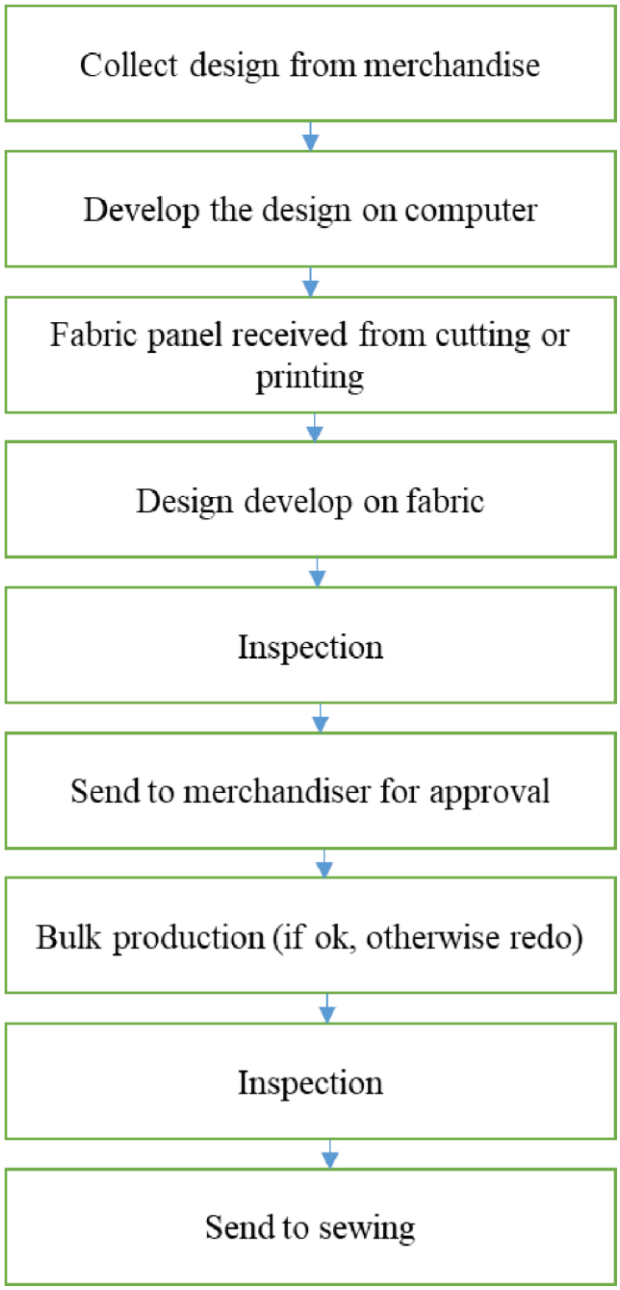


Fig. 5.22 Workflow of embroidery department

5.10.2 Embroidery Types

- Applique embroidery
- Sequin embroidery
- Taping embroidery
- Chenille embroidery
- Motif embroidery

Fig. 5.23 Tapping embroidery

Fig. 5.24 Sequin embroidery

5.10.3 Types of Embroidery Stitch

1. Satin stitch (stitch length: 1 – 10 mm)
2. Tatami stitch (stitch length: 0.8 mm)
3. Jam stitch
4. Zigzag stitch
5. Run stitch (stitch length: 1 – 7 mm)
    a. Single run
    b. Double run
    c. Triple run

Fig. 5.25 Tatami stitch

Fig. 5.26 Satin stitch

5.10.4 Types of yarn used in embroidery

- 120D/2, (100% Polyester)
- 40/2, 50/2, (95%poly 5% cotton)
- Lurex 120D/2 (100% poly)(Glassy metallic thread)

5.11 Garments Washing and Dyeing

Garments washing and dyeing is done to get various types of effect as per the buyer requirements. Esquire Knit Composite Ltd. is a knit based garments factory. So their washing plant is not large. They only performed washing with very small range as per buyer requirement.

5.11.1 Workflow of Washing Process

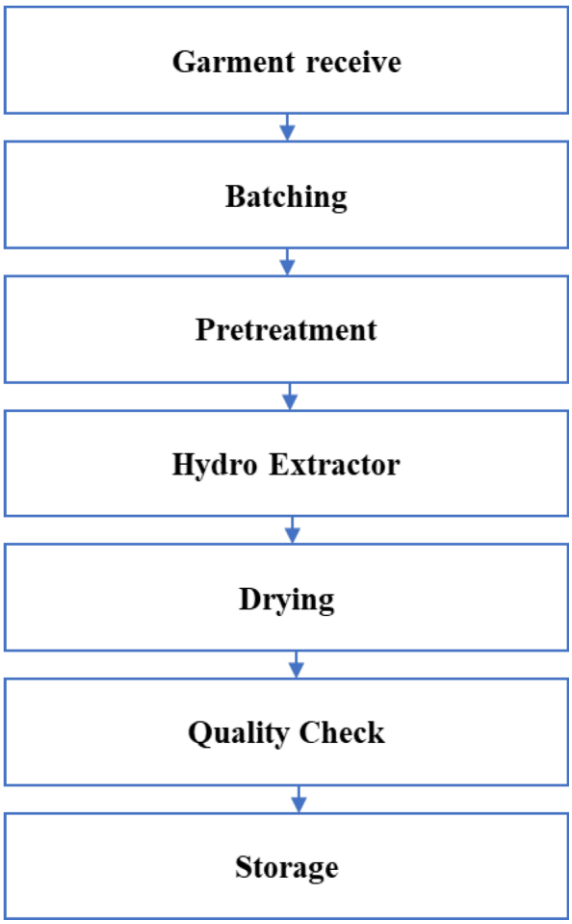


Fig. 5.27 Workflow of washing process

5.11.2 Different Types of Garment Wash in EKCL

- Normal wash
- Acid wash
- Silicon wash
- Enzyme wash
- Bleach wash
- PP spray
- Burnout wash
- Cool dyeing/Oil wash

Steps	Process Name	Procedure
1st Step	Desizing	1. Add Water 1:10 2. M/C Running 3. Add Detergent=0.5 gm/ltr. 4. Temperature 40-60°C 5. Time=5-10 min 6. Cold wash
2nd step	Softening	1. Add Water 1:6 2. M/C Running 3. Add Flax Softener=0.6 gm/ltr 4. Time=5-10 min 5. Drop the Liquor
3rd Step	Hydro extracting	Remove the Water
4th Step	Drying	1. Temperature 60-70°C 2. Time (40-50 min for hot dry)
5th Step	Delivery	

5.11.3 Chemical Used in Washing

- Innozyme ALC 190 Innozyme NPE-S89
- Enzyme-SL
- Crossden LTC
- Denimex-1000
- Biogreen LTC
- Ansipan D-Paste
- Clax 1002
- Backasol
- Acetic acid
- Antistain LP 30
- Textain Rm
- KCL
- Lavcon Pap
- Bleaching Powder
- Sodium Hypo Chloride
- Peroxide
- Sodium hypo sulphate
- NaOH
- PP
- Cationic softener-Flakes
- Silicon Softener
- Innosift 1800
- Ecosil 10sl
- Indosol CRF
- Crosfix DEN

5.11.4 Some Washing Recipe

1. Normal Wash

2. Bleach Wash

Steps	**Process Name**	**Procedure**
		80
1st Step	Desizing	i)Add Water 1:5 ii)M/C Running iii) Add Desizing Agent=03 gm/ltr. iv)Temperature 40-60°C v)Time=20 min
2nd step	Bleaching	i)Add Water 1:5 ii)M/C Running iii)Add Caustic soda=2% iv)Add H2O2=5ml/ltr v)Add Stabilizer=2.5 ml/ltr vi)Add Soda Ash=2% vii)Time=5-10 min viii)Drop the Liquor
3rd Step	Hot Wash	i)Add Water 1:5 ii)M/C Running iii) Temperature raise upto 60*C. iv)Contd. 5 min

4th Step	Neutralization	I)Add Water 1:5 ii)M/C Running iii)Acetic Acid=2 ml/ltr. iv)Temperature raise upto 60°C v)Contd. Process Time=20 min vi)Drop The Liquor vii)Unload Garments and Hydro extracting
5th Step	Delivery	

3. Silicon Wash

Steps	**Process Name**	**Procedure**
1st Step	Desizing	i)Add Water 1:10 ii)M/C Running iii)Temperature 50°C
		iv)Time=10 min v)Drop the Liquor
2nd step	Softening	i)Add Water 1:8 ii)M/C Running iii)Add Cationic Softener=0.6 gm/ltr iv)Silicon=0.5 gm./Liter v)Time=15-20 min vi)Drain the Bath
3rd Step	Hydro extracting	Remove the Water

4th Step	Drying	i)Temperature 75-85°C ii)Run about 35-40 min iii)After runtime 10-15 min for cold dry
5th Step	Delivery	

4. Acid Wash

Steps	**Process Name**	**Procedure**
1st Step	Prepare	i)Add Thermo 6 microball ii)Add KMnO4 by spreading on microball iii)Run M/c 10 mins iv)Add Garments and check after 2 mins v)Then run m/c 10 min
2nd step	Neutrilizing	I)Add Water 1:5 ii)M/C Running iii) Add Sodium Meta by sulphite=3 gm./liter.
		iv)Temperature= 40°C v)Contd. Process Time=10-12 min vi)Drop The Liquor vii)Unload the garments
3rd Step	Softening	i)Add Water 1:8 ii)M/C Running iii)Add Cationic Softener=0.6 gm/ltr iv)Silicon=0.5 gm./Liter v)Time=15-20 min vi)Drain the Bath

4th Step	Hydro extracting	Remove the Water
5th Step	Drying	i)Temperature 75-85°C ii)Run about 35-40 min iii)After runtime 10-15 min for cold dry

5. Burnout Wash At first Garments are kept in mixing of water and Asu salt in 10 minutes. Then take them in to hydro extractor for 30 seconds. After Hydro extracting send them in dryer with 120°C and run it 30 minutes. After Drying Neutralization done with soda ash + per-oxide + water with 80° C and 10-15 Minutes**.**

5.11.5 Workflow of Garments Dyeing

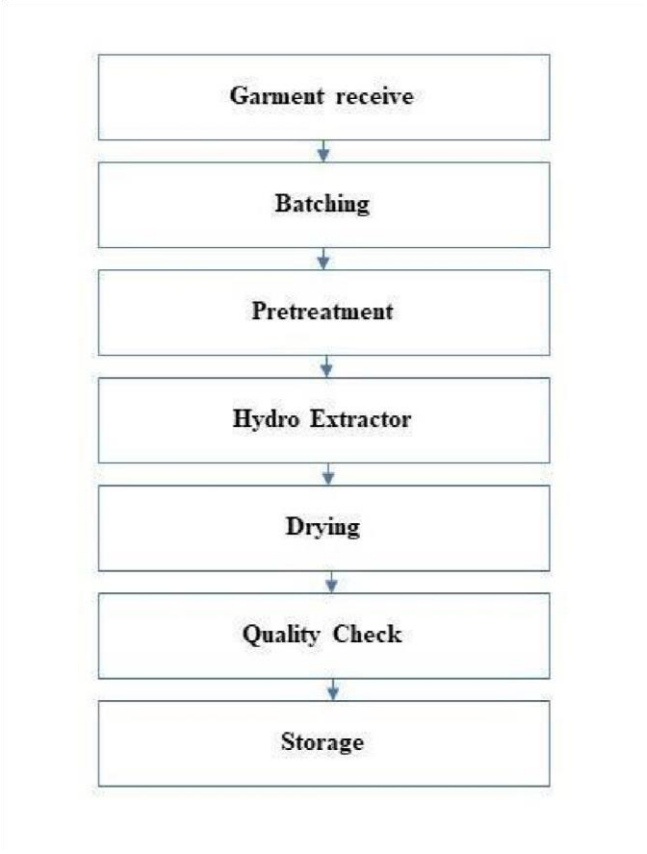


Fig. 5.28 Workflow of garment dyeing

5.11.6 Some Dyeing Recipe

Before Dye

After Dye

Dyeing:

1. Full Garments

Fig. 5.29 Garments dyeing (Developed sample)

Asuprint Red BEBA – 0.4%

Asuprint Orange BER – 1.2%

Asuprint Black BEB – 0.015%

BRG – 1%
FPI – 1%

Ec-Micro – 1 g/l

2. Tie Dyeing:

Fig. 5.30 Tie dyed sample

Asufast Scarlet BNL – 200 – 3.15%

Asufast Red 7B – 1%

Asufast Black NVA – 0.06%

Soda – 1 g/l

Salt – 30 g/l

3. Dip Dying:

Fig. 5.31 Dip dyeing

Water – 2000 Liter

Asufast Turquoise FBL – 400 – 200 gm

Asufast Royal Blue – 5 – 8 gm

Soda – 1 g/l

Salt – 25 g/l

5.12 Yarn Dyeing

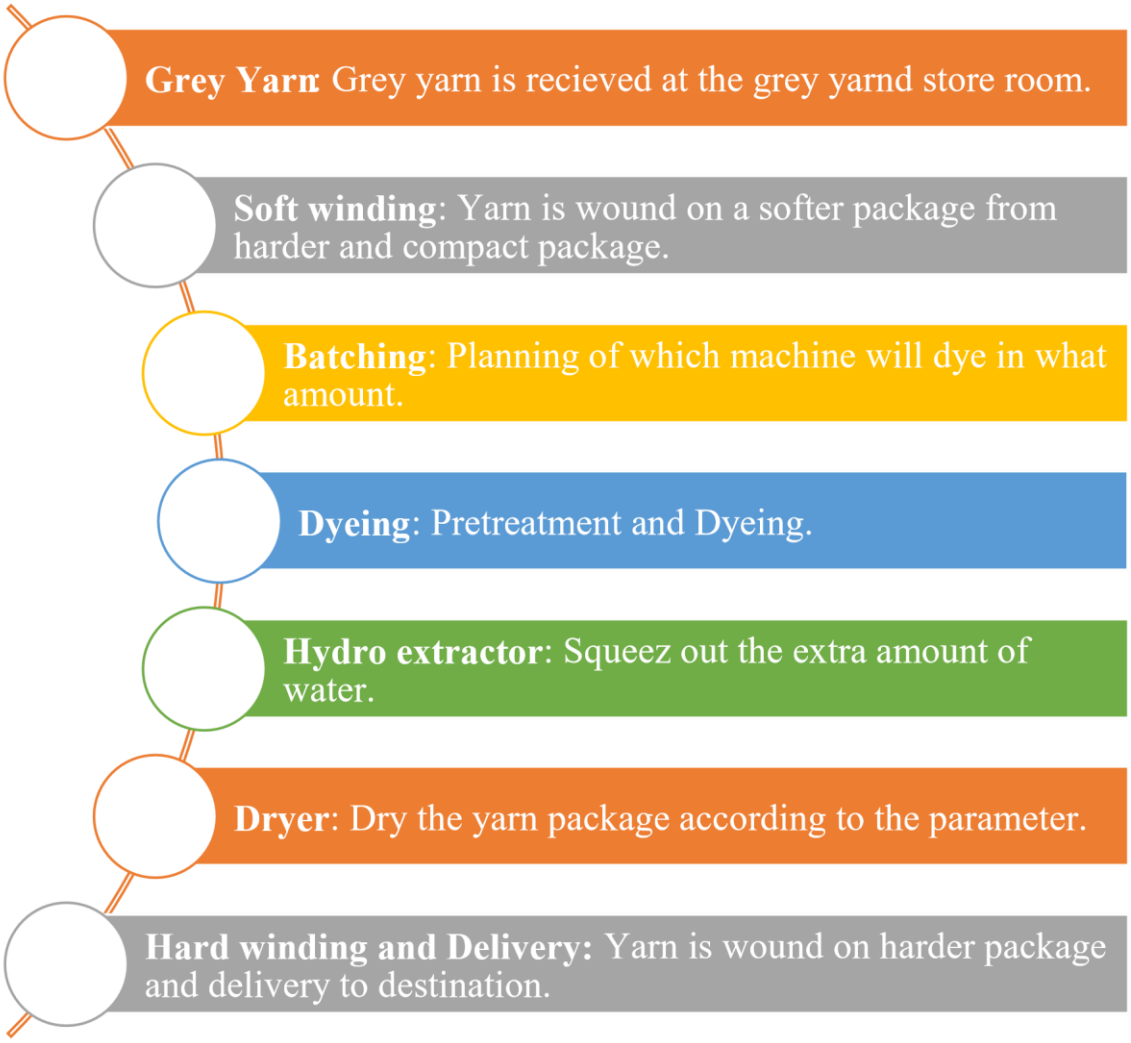
Dyeing can be done both on yarn and fabric. Yarn is dyed mainly for making stripes in the knitted fabric. Yarn is dyed in hank form or in the form of packages, namely comes, cheese or bobbins.

Fig. 5.32 Workflow of yarn dyeing (Package dyeing)

5.12.2 Advantages of Package Dyeing Over Hank Dyeing

- Elimination of hank reeling

5.12.1 Workflow of Yarn Dyeing



- Waste is less
- Back winding is faster
- More controlled dyeing with better levelness and fastness
- Lower liquor ratio causing saving in water, energy, dyes and chemicals.
- Lesser floor space
- Less number of labor
- High temperature dyeing and rapid drying
- Automation is easier

5.12.3 Drying Parameter

Table 5.6 Drying parameter

Name of the Yarn	Amount of water should be kept during drying
30/1 Viscose (Flat)	15-20 gm
30/1 Viscose (Vortex)	50 gm
20/1, 24/1, 26/1,30/1,28/1 Cotton Yarn	50-60 gm
30/1, 32/1, 34/1 Slub and All Slub	80-100 gm
30/1, 32/1, 34/1, 40/1 BCI and + All BCI Yarn	30-40 gm
40/1, 100/2, 80/2, 60/2, 40/2, 20/2 and All double cotton yarn	70-80 gm

5.13 Knitting Department

EKCL's Knitting Section produces all of the knit fabrics it needs to meet its entire export demand, using world's latest and most dependable Knitting Machines top brands from Germany, Italy and Japan. We produce numerous varieties of knit fabrics including single and double jersey, ribs, drop ribs, interlock, PKs, engineered strips, terry bush back fleece, sweat, using any kind of blends like cotton, polyester, cotton-poly, modal, viscose, poly viscose of various grams per square meter. At present it has capacity of 20 tons of knit fabrics per month.

5.13.1 Workflow of Knitting Department

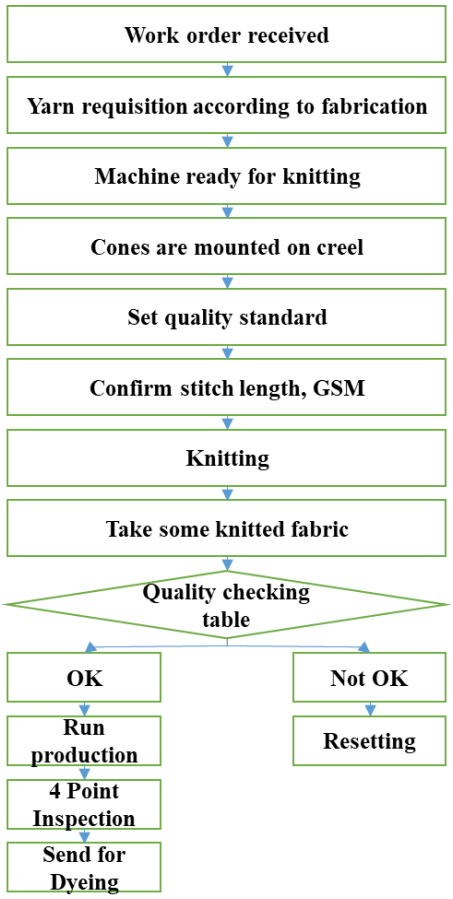


Fig. 5.33 Workflow of knitting department

5.13.2 Different Fabric and Its Diameter and Gauge Table

5.7 Fabric related parameters

Fabric Name	Diameter and Gauge
1X1 Rib	32” & 20G
2X2 Rib	40” & 18G

Feeder Stripe Rib	32” & 20G
Single Jersey	36” & 24G
	34” & 24G
	26” & 24G
Interlock	34” & 24G
Fleece	30” & 20G
	36” & 20G
Terry	30” & 20G
	30” & 24G

French Terry	30” & 20G
Single Lacoste	30” & 24G
	34” & 24G
	26” & 24G

5.13.3 Cam Arrangement of Different Fabric

1. **Single Jersey**

K	K
K	K

2. **Single Lacoste:**

K	T	K	K
K	K	K	T

3. **Double Lacoste:**

K	T	T	K	K	K
K	K	K	K	T	T

4. Single Cross Tuck:

T	K
K	T

5. Polo Pique:

K	K	T	T
T	T	K	K

6. Terry Fabric (2 Threads)

T	K	M	K
M	K	M	K
M	K	T	K

7. Angled Terry (2 Thread)

T	K	M	K	M	K
M	K	T	K	M	K

M	K	M	K	T	K

8. Fleece (3 Threads)

T	K	K	M	K	K
M	K	K	M	K	K
M	K	K	T	K	K

9. Angled Fleece (3 Threads)

T	K	K	M	K	K	M	K	K
M	K	K	T	K	K	M	K	K
M	K	K	M	K	K	T	K	K

5.14 Dyeing and Finishing Department

Dyeing is the application of dyes or pigments on textile materials such as fibers, yarns, and fabrics with the objective of achieving color with desired fastness. Dyeing is normally done in a special solution containing dyes and particular chemical material. Dye molecules are fixed to the fiber by absorption, diffusion, or bonding with temperature and time being key controlling factors. The bond between dye molecule and fiber may be strong or weak, depending on the dye used.

5.14.1 Workflow of Fabric Dyeing

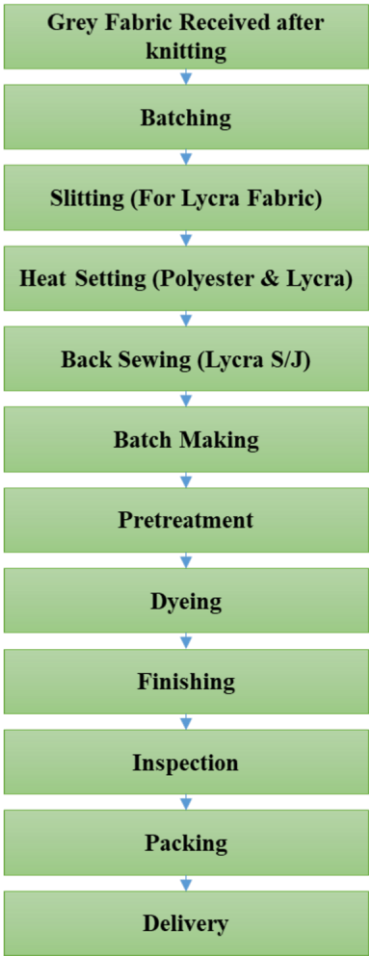


Fig. 5.34 Workflow of fabric dyeing

5.14.2 Batching

Production planning for dyeing is called “Batch Plan”. According to the batch no, color, width, style and construction the batch plan is made. It is the first steps before knit dyeing. Batching is the receiving section of grey fabric and sending section of grey fabric to the dyeing section which will dye. Batching is the process to get ready the fabrics which should be dyed and processed for a particular lot of a particular order. During batch preparation some points are considered. If some fault occurs during batch preparation then it affects the shade of dyed fabric.

For example: 5500 body fabric and 500 kg Rib for the collar have to dye in 750 kg (3 Nozzles) and 500 kg (2 Nozzles) machine.

Consider 95% of the machine capacity = 750 $\times$ 95% = 712.5 kg

So the plan can be (8 Batch)

56 kg Rib into per batch = 448 kg

644 kg body fabric into per batch = 5152 kg into 3 nozzles machine.

Rest fabric in one batch

348 kg body fabric + 52 kg rib fabric into two nozzles machine

$$\text{Reel Speed for machine} = \frac{Fabric\ Weight \times 1000 \times 39.37}{Dia \times GSM \times Nozzles \times Cycle\ Time}$$

So Reel speed for 750 kg machine will be = 277 m/min (Dia = 69 inch and GSM = 160)

Reel speed for 500 kg machine will be = 182 m/min (Dia and GSM same as before) But,

277 m/min is a long distance for a cycle. So we can double the rope then it will be 139 m/min (277/2 = 139).

5.14.3 Common Faults in Fabric Dyeing and Remedies

Table 5.8 Common fabric faults an remedies

Name of the faults	Causes	Remedies
Crack, rope & crease marks	-Poor opening of the fabric rope -Shock cooling of synthetic material -Incorrect process procedure -Higher fabric speed	-Pre-Heat setting -Lower rate rising and cooling the temperature -Reducing the m/c load -Higher liquor ratio -Running at a slightly higher nozzle pressure
Fabric distortion and increase in width	-Too high material speed -Low liquor ratio	-By decreasing both nozzle pressure & winch speed

Pilling	-Too high mechanical stress on the surface of the fabric -Excess speed during processing -Excess foam formation in the dye bath	-By using of a suitable chemical lubricant -By using antifoaming agent -By turn reversing the Fabric before dyeing
Running problem: -Ballooning -Intensive foaming	-Seam joining with too densely sewn -Pumping a 6:mixture of air and water	-By cutting a vertical slit of 10-15 cm in length for escaping the air. -By using antifoaming agent
	-Uneven pretreatment (uneven scouring, bleaching & mercerizing)	-By ensuring even pretreatment

Uneven dyeing	-Uneven heat-setting in case of synthetic fibers -Quick addition of dyes and chemicals -Lack of control of dyeing m/c	-By ensuring even heat-setting in case of synthetic fibers -By slow addition of dyes and chemicals -Proper controlling of dyeing m/c

Shade variation (Batch to batch)	-un even dyeing -improper liquor ratio -uneven penetration of dye molecules	-Use standard dyes and chemicals -Maintain the same liquor ratio -Follow the standard pretreatment procedure -Maintain the same dyeing cycle -Identical dyeing procedure should be followed for the same depth of the shade
Patchy dyeing	-Uneven heat in the machine. -Improper impregnation of dye liquor due to the low wetting property of the fabric. -Dye migration during intermediate dyeing.	-By proper pretreatment. -By adding extra wetting agent. -Heat should be same throughout the dye liquor.
Roll to roll variatiMeter Meter to variation	-Poor migration property of dyes. -Improper dyes solubility. -Hardness of water. -Faulty m/c speed, etc	-Use standard dyes and chemicals. -Proper m/c speed. -Use of soft water

Crease mark	-Poor opening of the fabric rope -Shock cooling of synthetic material -If pump pressure & reel speed is not equal -Due to high speed m/c running	-Maintaining proper reel sped & pump speed. -Lower rate rising and cooling the temperature -Reducing the m/c load -Higher liquor ratio
Dye spot	-Improper Dissolving of dye particle in bath. -Improper Dissolving of caustic soda particle in bath.	-By proper dissolving of dyes & chemicals -By passing the dissolved dyestuff through a fine stainless steel mesh strainer, so that the large un-dissolved particles are removed
Softener Mark	-Improper mixing of the Softener.-Improper running time of the fabric during application of softener. -Entanglement of the fabric during application of softener	-Maintaining proper reel sped & pump speed. -Proper Mixing of the softener before addition. -Prevent the entanglement of the fabric during application of softener

5.14.2 Fabric Finishing Works

Hydro Extractor:

- To remove the excess water inherited by the fabric during Dyeing
- To clean any unnecessary dirt or hairs if fabrics
- To soften the fabric if required by using softening agent **Dryer:**
- To dry the wet fabric

- Control the shade and GSM slightly **Slitting:**
- Slit cut the tubular fabric through the needle mark
- Remove excess water
- Prepare the fabric for next operation **Open Width Compactor:**
- To compact the fabric
- To control the shrinkage
- To maintain proper width and GSM **Stener:**
- To dry the fabric
- Heat set the synthetic fiber fabric
- Controlling the width of fabric
- Controlling the GSM of fabric
- Skewness and Bowing controlling of stripe fabric
- Spiralty and Twisting control
- Fabric hand feel modification like Softening or Hardening
- Shade control

CHAPTER-6 QUALITY SYSTEM

ISO defined Quality as, "The totality of features and characteristics of a product or service that bear on its ability to satisfy stated or implied needs". In simpler words, one can say that a product has good quality when it "complies with the requirements specified by the client".

For a product or service of better quality, we need quality assurance and quality control.

6.1 Quality Control

Quality control (**QC**) is a process by which entities review the quality of all factors involved in production. ISO 9000 defines quality control as "A part of quality management focused on fulfilling quality requirements".

This approach places an emphasis on three aspects (enshrined in standards such as ISO 9001)

1. Elements such as controls, job management, defined and well managed processes, performance and integrity criteria, and identification of records
2. Competence, such as knowledge, skills, experience, and qualifications

3. Soft elements, such as personnel, integrity, confidence, organizational culture, motivation, team spirit, and quality relationships.

6.1.1 Inspection

Inspection is a major component of quality control, where physical product is examined visually (or the end results of a service are analyzed). Product inspectors will be provided with lists and descriptions of unacceptable product defects such as cracks or surface blemishes for example.

Inspection in reference to the quality control in apparel industry can be defined as the visual examination or review of the raw materials (such as fabric, buttons, zippers, sewing threads, trims etc.), partially finished components of the garments to check if they meet the required measurements. The objective of inspection is to detect the defects as early as possible.

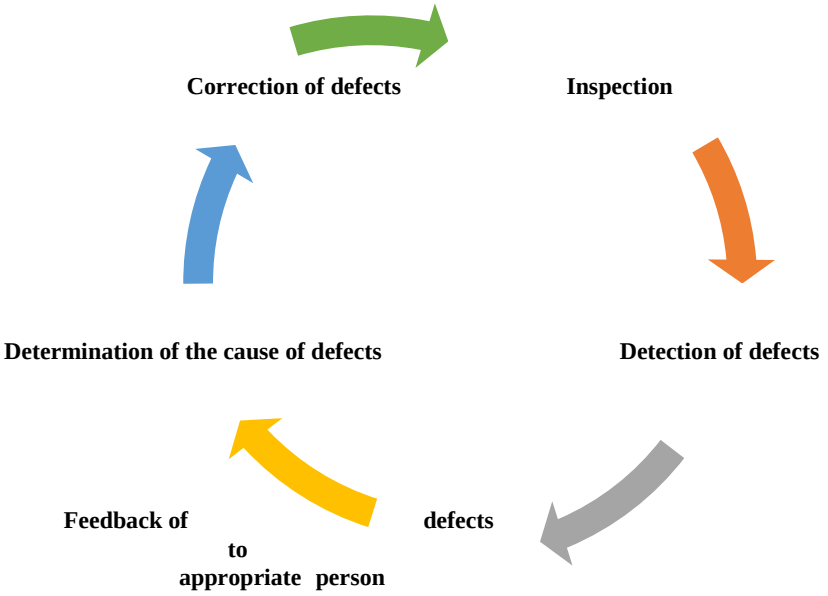


Fig. 6.1 Inspection Loop

Inspection is divided into three sections:

1. Raw Material Inspection
2. In-process Inspection
3. Final Inspection

6.1.2 Fabric Inspection

Fabric inspection falls under raw material inspection. It is done with the help of inspection machines. For fabric inspection 4-point system is used. The 4-point system total defect points per 100 square yards are calculated and normally those fabric rolls containing more than 40 points per 100 square yards are rejected.

The 44-pooint system, also called the American Apparel Manufacturers' Association (AAMA) point grading system for quality control is widely used by producers of apparel fabrics and by the Department of Defense in the United States.

Table 6.1 4-point system defects length and size

Defects length and size	Assigned point
Up to 3 in.	1
Over 3 in. and up to 6 in.	2
Over 6 in. and up to 9 in.	3
Over 9 in. but up to 36 in. or full width of fabric	4
Holes and openings 1 in. or less	2
Holes and openings over 1 in.	4

$$\text{Points per 100 sq. yards} = \frac{Total\ points\ scored\ in\ the\ roll \times 3600}{Fabric\ width\ in\ inch \times Total\ Yards\ Inspected}$$

6.1.3 Cutting Faults & Quality Inspection Cutting

Faults:

- Hole
- Stenter’s spot
- Miss stitch
- Lycra out
- Knots
- Foreign yarn
- Miss print
- Uneven print
- Dye spot
- Iron spot
- Dirty mark
- Needle line
- Patta/Barre
- Slub

To check the cut panel total 3 pcs of cut panel is taken. One from the top, one from the middle and one from the bottom. Then these three panels are inspected.

6.1.4 Traffic Light System for Quality Inspection in Garment Manufacturing

Like other quality inspection tools, the **traffic light inspection system** is widely used in garment quality inspection. This system is used to stop producing defect at the source. This is a random inspection system. Traffic light system is more effective in controlling shop floor quality than other quality tools because of its visual communication. At the same time, it measures operator’s performance level in quality. No operators like be presented themselves as lower quality makers. They concentrate on quality aspect during stitching garments.

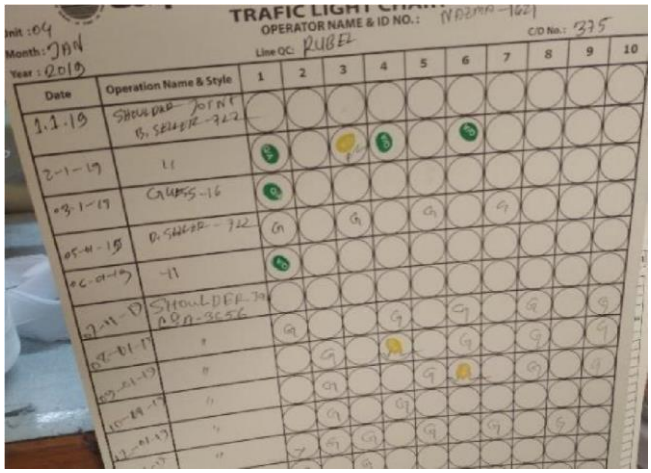


Fig. 6.2 Traffic light quality control in sewing line

In this system, seven pcs of garments are taken from the bundle.

1. If 7 pcs are OK – Green mark
2. If 6 pcs are OK – Yellow mark (need to stitch properly)
3. If 5 pcs or less than 5 pcs are OK only – Red mark (needs proper monitoring)

6.1.5 End Line Quality Check

In every sewing line at the end there is a quality check option. There any faults of sewing and measurement is checked. For measurement, every buyer gives some tolerance for acceptance.

Table 6.2 Ceilo measurement chart

Description (unit in cm)	Tolerance (+-)	Proto	XS	S	M	L
Neck width from HSP to HSP	0.5	19.5	15	16	17	18
Neck width to stretched	0.5		30	30.5	31	32
front neck drop from HSP	0.5	8.5	8	8.5	9	9.5
Shoulder slope in degree	4		18	18	18	18
Shoulder length	0.5	14.4	12.8	13.2	13.6	14
Armhole depth straight measured	0.8	22	19	20	21	22
Front shoulder breadth at 18 cm below HSP	1	40.5	32.8	35.2	37.6	40
Back shoulder breadth at 18 cm below HSP	1		34.8	37.2	39.6	42
Chest width at 2cm below armhole	1	52.2	40	44	48	52
Waist width at the tighest level (47 cm from HSP for L/52)	1		39	43	47	51

Bottom width straight measured	1	52	40	44	48	52
Bottom finish height (rib/hem/binding/…..)	1		2	2	2	2
Total front height from HSP	1.5	71.2	63.5	66.2	69.5	72
Center back height from neck seam to bottom edge	1.5	74	61.5	64.2	67.5	72
Side seam height	0.7		41	42.7	45	46.5
Short sleeve length (to sleeve edge)	0.7	22	18.7	19.7	20.7	21.5
Underarm short sleeve length (to sleeve edge)	0.5		5.7	6.2	6.7	7
Sleeve top width at 2 cm below armhole	0.5		16.4	16.4	17.2	18
Short sleeve bottom width at cuff seam (stretched)	0.5		14.9	14.9	15.7	16.5
Sleeve bottom finsih height (rib/hem/binding/cuff……..)	0		2	2	2	2
Collar band height at center back	0.3		0	0	0	25
Collar height at center back excluding collar band if any	0.5		7.5	7.5	7.5	5
collar point height	0.3		5	5	5	5
Front placket height	0.8		13.5	13	14	14.5
Front placket width	0		2.5	2.5	2.5	2.5
Top button position from from top of placket	0		1.5	1.5	1.5	1.5

6.1.6 Final Inspection Based on AQL

The AQL, together with the sample size code letter , is used for indexing the sampling plans and schemes provided in this part of ISO 2859 .

When a specific value of the AQL is designated for a certain nonconformity or group of nonconformities, it indicates that the sampling scheme will accept the great majority of the lots submitted, provided the quality level (percent nonconforming or nonconformities per 100units) in these lots is no greater than the designated value of AQL. Thus, the AQL is a designated value of percent nonconforming (or nonconformities per 100 units) that will be accepted most of the time by the sampling scheme to be used. The sampling plans provided are so arranged that the probability of acceptance at the designated AQL value depends upon the sample size for a given AQL, being generally higher for large samples than for small ones.

Samples may be drawn after all the units comprising the lot have been assembled, or during production of.the lot. In either case, the samples shall be selected at random.

When double or multiple sampling is to be used, each sample shall be selected from the entire lot.

For inspection buyer set AQL for critical, major and minor defects. For example LiDL want 0.0 for critical defects, AQL 2.5 for major defects, AQL 4.0 for minor defects. The range can vary from buyer to buyer.

Example of AQL Defects:

Critical Defects:

- Incorrect country or origin /fiber composition.
- Inconsistent labeling between UPC and outer box.
- Needle/pin in product.
- Rough sharp edges metal/plastic trim and composition.
- Missing safely warning Missing sewing label.
- Chemical orders.

Table 6.3 Sample Size Code

Lot or Batch Size			Special inspection levels				General inspection levels		
			S-1	S-2	S-3	S-4	I	II	III
2	to	8	A	A	A	A	A	A	B
9	to	15	A	A	A	A	A	B	C
16	to	25	A	A	B	B	B	C	D
26	to	50	A	B	B	C	C	D	E
51	to	90	B	B	C	C	C	E	F
91	to	150	B	B	C	D	D	F	G
151	to	280	B	C	D	E	E	G	H
281	to	500	B	C	D	E	F	H	J
501	to	1200	C	C	E	F	G	J	K
1201	to	3200	C	D	E	G	H	K	L
3201	to	10000	C	D	F	G	J	L	M
10001	to	35000	C	D	F	H	K	M	N
35001	to	150000	D	E	G	J	L	N	P
150001	to	500000	D	E	G	J	M	P	Q
500001	and	Over	D	E	H	K	N	Q	R

Table 6.4 Single Sampling plan for normal inspection

Sample size code letter	Sample size	Acceptance Quality Limits (normal inspection)										
		0.065	0.10	0.15	0.25	0.40	0.65	1.0	1.5	2.5	4.0	6.5
		Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re
A B C	2 3 5	↓	↓	↓	↓	↓	↓	↓	↓	↓ 0 1	↑ 0 1 ↓	0 1 ↕
D E F	8 13 20	↓	↓	↓	↓	↓	↓ 0 1	↓ 0 1 ↕	0 1 ↕	↕ 1 2	↓ 1 2 2 3	1 2 2 3 3 4
G H J	32 50 80	↓	↓	↓ 0 1	↓ 0 1 ↕	0 1 ↕	↕ 1 2	↓ 1 2 2 3	1 2 2 3 3 4	2 3 3 4 5 6	3 4 5 6 7 8	5 6 7 8 10 11
K L M	125 200 315	0 1 ↑	0 1 ↕	↕ 1 2	↓ 1 2 2 3	1 2 2 3 3 4	2 3 3 4 5 6	3 4 5 6 7 8	5 6 7 8 10 11	7 8 10 11 14 15	10 11 14 15 21 22	14 15 21 22 ↑
N P Q	500 800 1250	↓ 1 2 2 3	1 2 2 3 3 4	2 3 3 4 5 6	3 4 5 6 7 8	5 6 7 8 10 11	7 8 10 11 14 15	10 11 14 15 21 22	14 15 21 22 ↑	21 22 ↑	↑	
R	2000	3 4	5 6	7 8	10 11	14 15	21 22	↑				

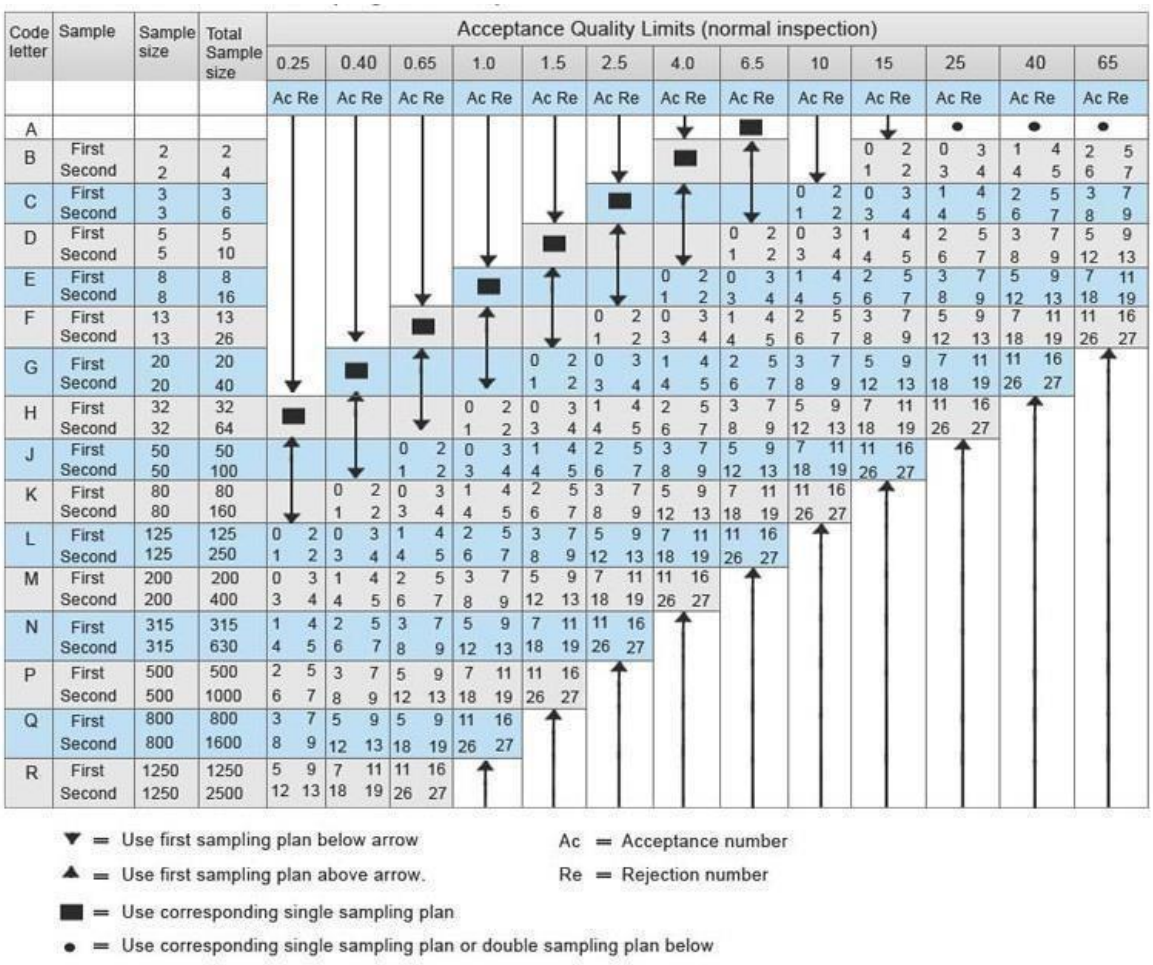
↓ = Use first sampling plan below arrow. if sample size equals or exceeds lot or batch size, do 100% inspection.

↑ = Use first sampling plan below arrow.

Ac = Acceptance number

Re = Rejection number

Table 6.5 Double sampling plan for normal inspection



Code letter	Sample	Sample size	Total Sample size	Acceptance Quality Limits (normal inspection)												
				0.25	0.40	0.65	1.0	1.5	2.5	4.0	6.5	10	15	25	40	65
				Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re
A				↓	↓	↓	↓	↓	↓	↓	■	↓	↓	●	●	●
B	First	2	2							■	↑	↓	0 2	0 3	1 4	2 5
	Second	2	4										1 2	3 4	4 5	6 7
C	First	3	3						■	↓	↑	0 2	0 3	1 4	2 5	3 7
	Second	3	6									1 2	3 4	4 5	6 7	8 9
D	First	5	5					■	↑	↓	0 2	0 3	1 4	2 5	3 7	5 9
	Second	5	10								1 2	3 4	4 5	6 7	8 9	12 13
E	First	8	8				■	↑	↓	0 2	0 3	1 4	2 5	3 7	5 9	7 11
	Second	8	16							1 2	3 4	4 5	6 7	8 9	12 13	18 19
F	First	13	13			■	↑	↓	0 2	0 3	1 4	2 5	3 7	5 9	7 11	11 16
	Second	13	26						1 2	3 4	4 5	6 7	8 9	12 13	18 19	26 27
G	First	20	20		■	↑	↓	0 2	0 3	1 4	2 5	3 7	5 9	7 11	11 16	↓
	Second	20	40					1 2	3 4	4 5	6 7	8 9	12 13	18 19	26 27	
H	First	32	32	■		↑	0 2	0 3	1 4	2 5	3 7	5 9	7 11	11 16	↓	
	Second	32	64				1 2	3 4	4 5	6 7	8 9	12 13	18 19	26 27		
J	First	50	50	↑	↑	0 2	0 3	1 4	2 5	3 7	5 9	7 11	11 16	↓		
	Second	50	100			1 2	3 4	4 5	6 7	8 9	12 13	18 19	26 27			
K	First	80	80		0 2	0 3	1 4	2 5	3 7	5 9	7 11	11 16	↓			
	Second	80	160		1 2	3 4	4 5	6 7	8 9	12 13	18 19	26 27				
L	First	125	125	0 2	0 3	1 4	2 5	3 7	5 9	7 11	11 16	↓				
	Second	125	250	1 2	3 4	4 5	6 7	8 9	12 13	18 19	26 27					
M	First	200	200	0 3	1 4	2 5	3 7	5 9	7 11	11 16	↑					
	Second	200	400	3 4	4 5	6 7	8 9	12 13	18 19	26 27						
N	First	315	315	1 4	2 5	3 7	5 9	7 11	11 16	↓						
	Second	315	630	4 5	6 7	8 9	12 13	18 19	26 27							
P	First	500	500	2 5	3 7	5 9	7 11	11 16	↓							
	Second	500	1000	6 7	8 9	12 13	18 19	26 27								
Q	First	800	800	3 7	5 9	5 9	11 16	↑								
	Second	800	1600	8 9	12 13	18 19	26 27									
R	First	1250	1250	5 9	7 11	11 16	↓									
	Second	1250	2500	12 13	18 19	26 27										

▼ = Use first sampling plan below arrow
▲ = Use first sampling plan above arrow.
■ = Use corresponding single sampling plan
● = Use corresponding single sampling plan or double sampling plan below

Ac = Acceptance number
Re = Rejection number

Major Defects:

- Fabric flaw on presentation area and visible at area level
- Snags at arm level
- Shade variation
- Soiling, dirty marks
- Non-inclusion
- Needle damage mark
- Broken stitch
- Cracking stitch
- Button missing
- Unraveling buttonhole
- Fit measurement
- Different between two side (shade variation)
- Bar—tack out of range

- Zip broken
- Printing defect
- Washing defect

Minor Defects:

- Poor thread matching
- Poor thread join and bar tack
- Thread not trimmed properly (poor trimming)
- Missing trimming
- Measurement outside tolerance (out of tolerance)
- Stepped seams/hem
- Tension on elastic

6.1.6 Printing Faults & SOP of Print Quality **Printing Faults:**

1. Art work placement
2. Cracking
3. Bleeding
4. Stick-in
5. Mottled
6. Scrimps
7. Wicking
8. Burning etc

SOP of Print Quality:

1. At first receive bulk production approval
2. Q.C must be sent a work instruction all Buyer &file
3. When the production start 1st time all inline quality must be checked print design, color, print grading, print placement etc.
4. All problematic panels must be identifying & informed to production team.
5. When Off line Q.I receive goods then they 1st check print size, color, grading, design etc.

6. Then they inspection all fabric faults (print spot, print damage, cracking, screen water, screen out, color passing, glitters etc.
7. Then check all fabric faults some s hole, cut pcs, spot, etc.
8. All time reject body send reject store and defects body send production team for rectify.
9. When all quality inspection white body they must be used hand globs
10. When goods ready for delivery then delivery man must be checked (wash test report, print design, size)
11. Cut panel Shrinkage check after curing
12. Must all Q.I write Curing M/C No, Temp, Speed on
13. Keep all record accordingly

6.1.7 Faults in Embroidery

- Stitch gap
- Bobbin out
- Oil sport
- Miss thread
- Measurement up down
- Needle hole
- Broken sequin
- Fishtail

6.1.8 Faults in Garments Washing

- Color shading variation
- Fabric damage
- Print problem
- Crease marks
- After wash hole
- Bleach spot
- Over/Low blasting
- Poor hand feel High hairiness
- Poor brightness

6.1.9 Faults in Knitting

- Needle mark
- Sinker mark
- Lycra cutting
- Feeder problem
- Lycra out
- Lycra drop
- Thick& thin
- Dia mark
- Wrong design
- Pin hole
- Star
- Dirty spot
- Count mix
- Oil spot

6.10.9 Faults in Fabric Finishing

- Bias and bow
- Stain
- Abrasion mark
- Dirty or soil
- Water mark
- Shiny mark etc.

6.2 Quality Assurance

The ISO 9000 definition states that quality assurance is part of quality management focused on providing confidence that quality requirements will be fulfilled. Both customers and managers have a need for quality assurance as they cannot oversee operations for themselves. They need to place trust in the organization's processes and thus avoid constant intervention.

Quality assurance activities do not control quality, they establish the extent to which quality will be, is being or has been controlled. All quality assurance activities are post event activities and off line and serve to build confidence in results, in claims, in predictions etc.

For every operation in EKCL, an SOP is set no matter how tiny the work is. This falls under the category of quality assurance.

CHAPTER-7 MAINTENANCE

7.1 Introduction

The maintenance is defined as the act of maintaining or the state of being maintained or the work of keeping something in proper condition. The maintenance procedure of the sewing machine can be in by either machine operator or a mechanical engineer from the apparel industry. Since the operator is working on the machine, he or she can understand the small abnormalities in the machine at the very beginning and can avoid the major issues. Causes of machine malfunction are-

- Improper cleaning
- Improper tightening of machine parts during machine cleaning and adjustment
- Improper machine part adjustment when it is set up for operation
- Failure to replace machine parts before being worn down due to operational control limits
- Improper lubrication

7.2 Maintenance Classification

The machine maintenance procedure can be classified into major categories as given in Fig. 7.1.

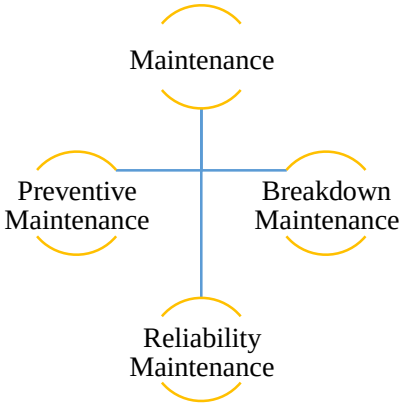


Fig. 7.1 Classification of maintenance

7.2.1 Preventive Maintenance

Preventive maintenance is the process to prevent machine problems and deterioration before it occurs in a major level through the following acts:

- Daily maintenance to prevent deterioration (cleaning, checking, lubricating, tightening bolts)
- Periodic inspection and facility diagnosis **Preventive Maintenance in Sewing Section:**

Preventive maintenance for sewing machines in EKCL for **January 2019 to June 2019** is given below:

Everyday machine service:

- Needle plate, Feet dog, Pressure feet and Bar, needle bar and Bush, Face plate, table top full clean, top cover and back cover area check and clean.(M/H)
- Machine's pulley area full check and clean, all machine's Properly sewing check.(M)
- Idle Machine's needle closing.(M/H)
- Parts short, broken, check and change if required than repair.
- M/c motor check and service.(E) **Every week preventive maintenance:**
- Paddle unit and paddle mate , Machine stand, Thread stand , Thread stand check and clean if required than properly repair.(M)
- Wire and plug, air line,air pipe, nipple Steam line check, and clean if required than repair.(E)
- Eye glass, Finger Guard, Motor Pulley cover , Belt cover, Control box, Neddle, Hook and lopper point check if required than properly repair.(M+E)

- All machine upper and lower knife check, knife sharp and change properly.(M)

Every month preventive maintenance:

- Oil level check, Open oil tank clean, oil line block and Leakage check and clean if required than properly repair.(M)
- Machine's Sound, Motor sound , clash sound, fan sound, belt sound , iron and Table sound check if required than properly repair (M+E)
- All machine's , Motor, control box,Switch board , Bus bar, Light and light shed, fan, Cooling fan full check and clean if required than properly reapair,(M+E)
- Fusing m/c,N-detector Mutting m/c, thread sucking machine ,thread cutting m/c check and clean if required than properly repair.(E+M) **After three month preventive maintenance:**
- All machine's and motor grease, Mobil and Oil g-Give (M/E)
- All open oil tank machine's oil tank completely check and clean with must bne oil changed (M)

After six months preventive maintenance:

01.All closes oil tank machine's oil tank completely clean must be oil changed.(M)

02.Motor and Fan for all parts with Bearing Check and clean if need grease, Mobil and oil then Give or damaged parts changed (E)

Preventive Maintenance in Dyeing Section:

Normally preventive maintenance is done here. For winch dyeing m/c it is kept for 15 days & for finishing floor it is kept for 15 days. During maintenance procedure following points should be checked.

Table 7.1 Mechanical maintenance check list

SL NO.	Items needs to be checked & serviced
1	Grease the m/c bearing
2	Cleaning of drain valves, replace seals if required

3	Check air supply filters, regulators auto drain seals
4	Clean filters element & below out
5	Greasing of unloading roller bearing
6	Checking of oil levels & bolts of unloading roller gearbox
7	Complete cleaning & machine
8	Checking unloading roller coupling & Packing
9	Checking & cleaning (if required) of main vessel level indicator
10	Check the oil level pump bearing & refill if required
11	Check the function or heart & cool modulating valves
12	Check all belts & belt tension
13	Check all door seals

Table 7.2 Electrical maintenance check list

SL NO.	**Items needs to be checked & serviced**
1	Check main panels
2	Check panel cooling fan & clean its filter
3	Clean main pump inverter & its cooling fan
4	Check all circuit breaker ,magnetic conductor & relays
5	Check current setting of all circuit breaker & motor over load
6	Visual checking of all power & control cables

7	Check a II of the motor's terminals
8	Check & clean fluff & dirt at all motor fan covers
9	Check DC drive of Neel motors
10	Check all pressure switches

11	Check calibration of main vessel & all addition tank
12	Check all signal isolators
13	Check setting & operation of lid safely switches
14	Check setting of tangle sensors
15	Check all pneumatic solenoids
16	Check all indicating lamps
17	Check calibration of heating/ cooling modulating valve
18	Check all on/off switches

7.2.3 Breakdown Maintenance

Breakdown Maintenance is referred to repair and maintenance work performed on a machine, production plant or component, be it mechanical or electrical after it has failed or broken-down unexpectedly. It is also referred to as maintenance or engineering work related to unforeseen plant breakdowns. It is not a planned event and as such can cost the factory lost production and sales as well as other expenses such as out of budget maintenance costs including overtime, technician call outs and urgent delivery fees for spare parts or support.

7.2.3 Reliability Maintenance

Reliability maintenance is a corporate-level maintenance strategy that is implemented to optimize the maintenance program of a company or facility. The final result of an RCM program is the implementation of a specific maintenance strategy on each of the assets of the facility.

An effective reliability-centered maintenance implementation examines the facility as a series of functional systems, each of which has inputs and outputs contributing to the success of the facility. It is the reliability, rather than the functionality, of these systems that are considered. The SAE JA1011 has a set of minimum criteria before a maintenance strategy can be called RCM (Gulati). The seven questions that need to be asked for each asset are:

1. What are the functions and desired performance standards of each asset?
2. How can each asset fail to fulfill its functions?
3. What are the failure modes for each functional failure?
4. What causes each of the failure modes?
5. What are the consequences of each failure?
6. What can and/or should be done to predict or prevent each failure?
7. What should be done if a suitable proactive task cannot be determined?

7.3 Maintenance Tools and Equipments

Table 7.3 Maintenance tools

Maintenance tools	Function
Tread trap	Joining of broken metallic parts
Cutting disc	For cutting pipes, rods
Globe valve	Fitting for steam line
Union	Fitting for water, steam line
Union Elbow	Fitting for water, steam line
Gear oil	Lubrication

Cutting oil	Lubrication
Hydraulic oil	Lubrication
Oil gun	Oil application
Spanner	Tightening of nut bolts
Master range	Tightening of nut bolts
Flat/Star screw driver	Screw tightening & loosening
Hacksaw blade	Cutting
Spray gun WP40	Spraying a chemical named WP40
Drill m/c	Drilling to make hole
Grinding m/c	Grinding
Hacksaw Frame	Cutting
Grease	Lubrication

CHAPTER-8 UTILITY SERVICES

8.1 Introduction

Utility provides service to industry process. Utility department takes care of following important areas like:

- Electrical
- Electronics
- Civil
- Mechanical

The department takes care of water, power, fuel and energy and effluent treatment plant. Beside that they are directly in touch with government bodies and compliance agencies.

The following utility facilities are available at **Esquire Knit Composite Limited.**

- Water
- Steam
- Electricity
- Gas
- Compressed air
- Conditioned air
- Effluent treatment

8.2 Water

ECKL dyeing water is lifted from below 550 ft. by submersible pumps. These pumps do not supply water directly to concerned department rather than via Water Treatment Plant (WTP). There are 4 WTP units and each of them has 3 vessels for water purifications and processing.

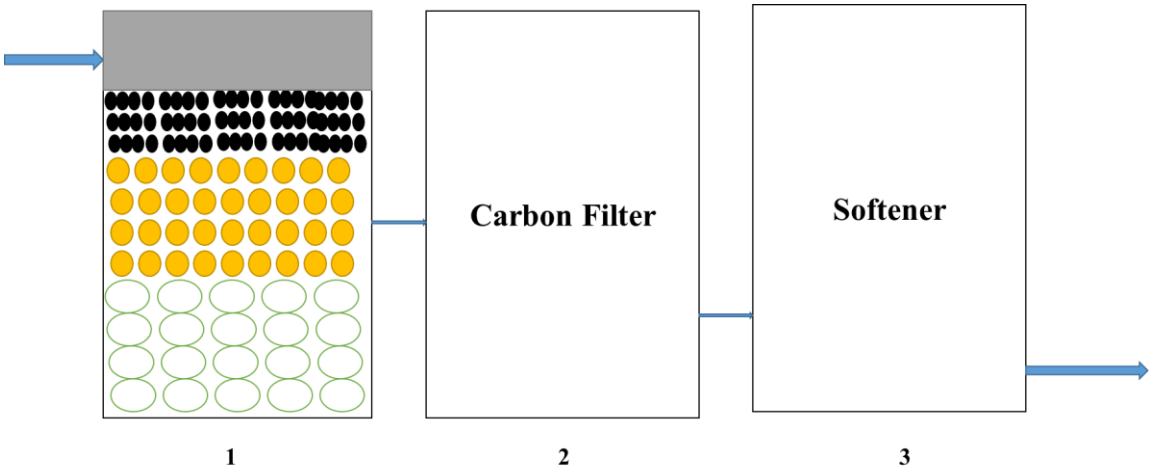


Fig. 8.1 Water treatment plant diagram

1. Multi-layer filter: It removes all dust particles from the water.
2. Carbon filter: Removes ferrous and ferric ions, fluoride and chlorine ions, odurs.
3. Softener tank: Demineralization by using Polyurethane resin. After a certain amount of time backwash with brine is given to reactivate resins.

8.3 Electricity

Esquire is fully depended on their own generator for their electricity. They are able to produce 5MW electricity in their own generator facility. They use gas generator as gas is cheap.

Fig. 8.2 Waukesha Gas Generator

Dresser-Waukesha Natural Gas Fired Engine Generator

Engine - Waukesha Enginator

Model 16V-AT27GL Natural Gas Engine.

Serial #C-94126/1. Speed 900 RPM.

Ignition Timing BTDC 22. Min. WCI 91.

Service 4073 HP.

2.9 MW.

8.4 Boiler

For different processing and finishing purposed steam is used. Stream is produced by boilers. There are several boilers in EKCL and Shellmax is one of the. It is a fire tube boiler.

Fig. 8.3 Steam boiler

Capacities : Up to 40 tons

Pressure : In the range of 10.54 to 17.54 Kg/cm^2 (g)

Temperature : Up to 75°C

Firing fuels : LDO, FO, LSHS & natural gas

Efficiency : Overall efficiency of 88 % (+/-2%) on NCV

8.5 Chiller

A chiller is a machine that removes heat from a liquid via a vapor-compression or absorption refrigeration cycle. This liquid can then be circulated through a heat exchanger to cool equipment, or another process stream (such as air or process water). As a necessary by-product, refrigeration creates waste heat that must be exhausted to ambience, or for greater efficiency, recovered for heating purposes.

Chilled water is used to cool and dehumidify air in mid- to large-size commercial, industrial, and institutional facilities. Water chillers can be water-cooled, air-cooled, or evaporative cooled. Water-cooled systems can provide efficiency and environmental impact advantages over air-cooled systems.

Chiller is used Embroidery section as some embroidery machine is too hot during working and they need to be cooled down. They are also used in air conditioning in Lab, Conference room and different important facilities where controlled environment is required.

Esquire Knit Composite use Lithium Bromide which is a sublime chemical and helps to evaporated the water quickly by taking the heat from the environment.

8.6 Effluent Treatment Plant (ETP)

Industrial wastewater treatment describes the processes used for treating wastewater that is produced by industries as an undesirable by-product. After treatment, the treated industrial wastewater (or effluent) may be reused or released to a sanitary sewer or to a surface water in the environment.

8.6.1 Overview of ETP

Textile dyeing plants generate wastewater that contain synthetic and natural dyestuff, gum thickener (guar) and various wetting agents, pH buffers and dye retardants or accelerators. Following treatment with polymer-based flocculants and settling agents, typical monitoring

parameters include BOD, COD, color, sulfide, oil and grease, phenol, TSS and heavy metals (chromium, zinc, lead, copper).

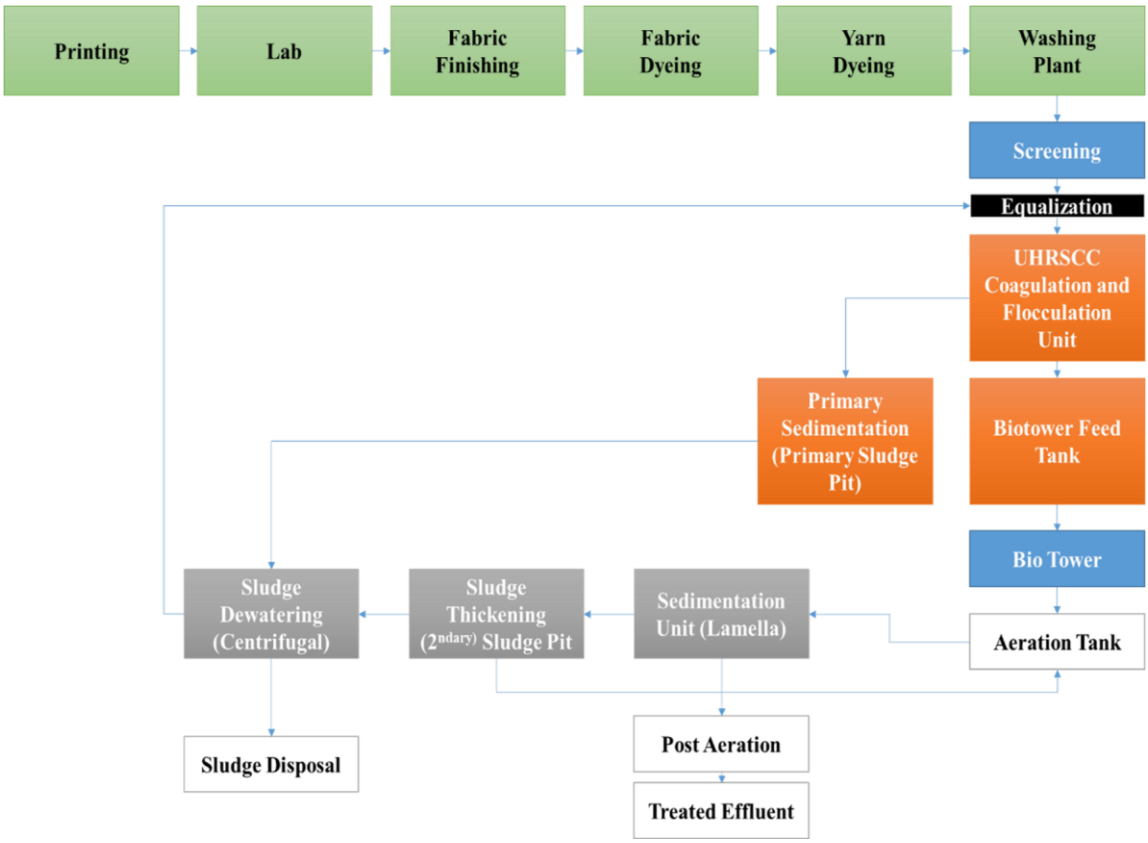


Fig. 8.4 ETP of Esquire Knit Composite Limited

8.6.2 Functions of Different Unit of ETP Plant **Screening unit:**

It works like a filter. By filtering waste water, it removes threads, pieces of fabrics, small metal pieces etc. In this unit a rotating brush is used for clean the pores of screen. The brush rotates periodically.

Equalization Tank:

Different waste water from varies process is stored and makes a homogeneous mixture by mixing different concentration of waste water. During equalization temperature of water should be lowered so that bacteria can survive and function properly. Because if the temperature of water is greater than 50℃ then bacteria will die. Equal mixing is done with the help of diffuser below the equalization tank.

Coagulation and Flocculation Unit:

Here lime water, Ferrous sulphate, polymer is added for coagulation and flocculation of particulates. Chemical Sludge are collected in primary sedimentation unit.

Bio Tower Feed Tank and Bio Tower:

P^H is checked for feeding into bio tower. HCL is added to lower the P^H if it is greater than 9.

Aeration Tank:

In this tank the effluent is aerated and cowdung is added so that bacteria can grow that eats the waste. The sludge is stored in secondary sludge pit.

Post Aeration:

After extracting sludge from effluent water is aerated again so that dissolved oxygen is increased then it is released into environment.

8.6.3 Treated Effluent Parameters

TDS: Below 2100 ppm

P^H: 6 – 9

DO: At least 4.5 mg/l

COD: Below 200 mg/l

BOD: Below 50 mg/l

CHAPTER-9 STORE AND INVENTORY CONTROL

9.1 Introduction

Inventory control is crucial part of every industry. Inventory control of Apparel, textile and fashion industry must keep inventory in their warehouse/store. Inventory control is called stock management which save cost, time and increase work efficiency of your warehouse. Proper inventory control in apparel and textile warehouse will ensure market competitiveness in international market.

9.2 Scope of Inventory Control

1. Raw Material

a. Dye
b. Other Chemicals
c. Grey Fabric

2. Finished Fabric
3. Spare Parts

9.2.1 Inventory Control System for Raw Materials **Dye**

store & other chemicals store :

- Both of these are received by the store in charge.
- First he sends these to quality in-charge for inspection. If they are found to be of required quality, then they are taken to store by the storekeeper.
- Store in-charge supplies these when required and records the date, type of material, quantity and section in which supplied, in his register book. **Grey fabric store :**
- Grey fabric is usually stored in another storeroom, which is separate from dyeing shade.
- Grey fabric is first sent to the QC department for quality assurance and then taken to the storeroom.
- Grey fabric is received by fabric store in-charge.
- He supplies the fabric as per requirement and records the date, type of material, quantity and section in which supplied, in his register book.

9.2.2 Inventory Control System for Finished Fabric

- Finished fabric from the compactor or stenter goes to inspection team. Here inspection is done by a four points system.
- Required GSM, width (diameter), shrinkage, Spirality, wash fastness, rubbing fastness etc are tested from the lab before packaging.
- After finishing the fabric is kept in package before their transfer to the garments department.
- It is controlled by the finishing in-charge who keeps a list of total finished product. He also keeps a list of delivery products.
- He supplies the fabric as per requirement and records the date, type of material, quantity and section in which supplied, in his register book.

9.2.3 Inventory Control System for Spare Parts

- Spare store officer keeps the spare parts in store and makes a list of spare parts.
- If the spare parts are little in stock, he gives requisition to maintenance manager.

CHAPTER-10 MERCHANDISNG DEPARTMENT

The primary concern of an apparel firm is to provide a product line that will meet the needs of the selected target market and produce a profit so the firm can grow. In the textile industry, merchandisers have a predominantly significant role owing to the exhaustive nature of product range. The practice of buying and selling materials and services is called merchandising. Merchandising activity coordinates different departments in the garment industry. It develops a valuable relationship with the buyers. It builds an excellent relationship with the buying houses and the merchandiser concentrates on queries, order processing and assessment of apparel products. All these aspects make the merchandising activity an important role in the garment industry.

10.1 Job Description of a Merchandiser

Job of a merchandiser varies from industry to industry even buyer to buyer. Here is a typical job description for a merchandiser who handles the LiDL buyer.

- New queries ○ Development sample ○ Costing ○ Pricing

Below works are done after receiving the order sheet

1. Order sheet checking
2. PI submit for L/C
3. Size breakup
4. Lab dip requesting
5. Bulk fabric submission and approval

6. Accessories & trims list
7. Preparing the internal order sheet
    a. Fabric order
    b. Sewing thread
    c. Accessories booking

8. Sampling
    a. Fit sample
    b. Size set sample
    c. PP sample
9. Production planning
10. Follow up production
11. Shipment (Ex-factory)

10.2 SOP for (LiDL) bulk execution in Esquire Knit Composite Ltd.

- Risk factor analysis of fabrics and garments
- Bulk fabric & sewing accessories as per OTT (45 day before ex-factory)
- PP approval required before start bulk cutting
- Bulk fabric lot approval from buyer QA before cutting
- Size set need to review by buyer QA of Bangladesh
- Need to do PP meeting with buyer QA to start bulk cutting & sewing line.
- Fabric has to support line feeding considering print, embroidery and washing.
- Buyer QA randomly visit factory to review quality & delivery.

10.3 Samples Needed for Approval

- Confirmation sample: Correct fabric, color, print, applique for approval by buyer. This is for approval of fabric, style and color. Once confirmation samples are approved, factory can arrange for bulk materials.
- Size set samples: Correct fabric, available colors except black and white for approval by third party institute. This is for approval of measurement, fit and workmanship. After approval, you will get bulk measurement chart.
- Photo sample: Correct fabric, color, print, applique and trims to be sent nominated agency for photo shooting to the photo inlay file.

- PP sample: Using bulk materials with correct measurement representing bulk production, samples to be approved by buyer. After the approval factory can start cutting for bulk production.

10.4 Order Placement

LiDL places order 4 times in a year.

1. **January selection:**
    a. Price quotation and negotiation: from mid-February to early March.
    b. Order placement: Around mid-March.
    c. Garment delivery: From end June, July, and August to early September.
2. **April selection:**
    a. Price quotation and negotiation: from mid-May to early June.
    b. Order placement: Around mid-June.
    c. Garment delivery: From end September, October, and November to early December.
3. **July Selection:**
    a. Price quotation and negotiation: from mid-August to early September.
    b. Order placement: Around mid-September.
    c. Garment delivery: From end December, January and February to early March.
4. **October Selection:**
    a. Price quotation and negotiation: from mid-November to early December.
    b. Order placement: Around mid-December.
    c. Garment delivery: From end March, April, and May to early June.10.5 Material Checklist for Physical and Chemical Test

In each of the selection LiDL order small kids and baby wear (Sub brand: Lupilu), big kids item (Sub brand: Pepperts), sportswear (Sub brand: Crivit), workwear (Sub brand:Powerfix), Menswear (Sub brand:Livergy), Ladies wear (Sub brand: Esmara) and ladies underwear (Sub brand: Jolinesse).

10.5 Material Checklist for PPC Test

Table 10.1 Physical and Chemical material check list

Serial No.	Materials	Quantity
1	Main Fabric	Per color 3m / style
2	Other fabric (Flat knit collar)	Per color 40 pcs
3	Other fabric (Lining, Mesh, Binding)	50g/style (don't cut into pcs)
4	Padding	30 pcs per style
5	Zipper	40 pcs /style
6	Printing Swatches	40 pcs /style
7	All sewn in labels	40 pcs /style
8	Elastic tape	50g/style (don't cut into pcs)
9	Hook and Loop	30 pairs per style
10	Sewing Threads	1 cone /style/color
11	Button	40 pcs /style
12	Interlining	50g/style

10.6 Costing Sheet

Table 10.2 Costing Sheet of Esquire

ESQUIRE KNIT COMPOSITE			
Buyer	LiDL Hong Kong Limited	Date	30/09/2018
Style Number	308351 A.B.C	Costing Serial No.	HO/2370
Style Description	Men's Polo Shirt	Amendment No.	2
Seasons	2018	Sales Contract L/C No.	

Order Qty.	152194	Costing Term	FOB

Description	Classification	GSM	Position	Color	Width	Quantity	FOB/Ex-Price	Ship Mode	UOM	Net Rating	Wastage %	Sub-Total	Total
FABRIC													
100% Cotton	Pique		Body+ Placket		82	43484	5.5	By Sea	Grams	295.8378	2.75	0.464885	
100% Cotton	Pique		Body+ Placket		82	65226	5.500001	By Sea	Grams	291.6662	2.75	0.667545	
100% Cotton	Pique		Body+ Placket		70	43484	5.300001	By Sea	Grams	299.1669	2.75	0.453002	
100% Cotton	Pique		Silde Slit 1		82	43484	5.5	By Sea	Grams	7.5	0	0.011785	
100% Cotton	Pique		Silde Slit 2		82	65226	5.500022	By Sea	Grams	6.6667	0	0.015715	
100% Cotton	Pique		Silde Slit 3		70	43484	5.499974	By Sea	Grams	5.8333	0	0.009166	
100% Cotton	Flat Knitted		Collar 1			43484	0.166667	By Sea	Pcs.	1.0175	1.75	0.04845	
100% Cotton	Flat Knitted		Collar 2			65226	0.166667	By Sea	Pcs.	1.0175	1.75	0.072684	
100% Cotton	Flat Knitted		Collar 3			43484	0.166667	By Sea	Pcs.	1.0175	1.75	0.04845	
100% Cotton	Flat Knitted		Cuff-1			43484	0.083333	By Sea	Pcs.	2.035	1.75	0.04845	
100% Cotton	Flat Knitted		Cuff-2			65226	0.083333	By Sea	Pcs.	2.035	1.75	0.072683	
100% Cotton	Flat Knitted		Cuff-3			43484	0.083333	By Sea	Pcs.	2.035	1.75	0.04845	
Cost of Fabric													1.961265
Cost of Finance on Fabric													0.019613
Total Fabric Cost													2.001057

SEWING													
Label-Main	Heat Seal					152194	0.013333	By Sea	Pcs.	1	7	0.014266	
Interlining						152194	0.22	By Sea	Yds.	0.1375	3	0.031158	
Care Label	Satin					152194	0.0075	By Sea	Pcs.	3	3	0.023175	
Sticker	Security					152194	0.004167	By Sea	Pcs.	2	5	0.008751	
Button	16L, 4 H					152194	0.000213	By Sea	Pcs.	3	3	0.008059	
THREAD													
Sew. Thead	Sew. Thead			TBA		152194	0.000213	By Sea	Mtr.	215	2	0.046711	
Total Sewing													0.13212

PACKAGING													
Carton	5 Ply					152194	0.9	By Sea	Pcs.	1	2	0.065572	
Photo in lay	Photo in lay					152194	0.141667	By Sea	Pcs.	1	2	0.1445	
Blister Poly	Plastic			Transperant		152194	0.113417	By Sea	Pcs.	1	2	0.008322	
Tag	Price Hang					152194	0.01	By Sea	Pcs.	1	2	0.0102	
Carton T & B	Paperr\					152194	0.055	By Sea	Pcs.	2	2	0.00935	
Carton Sticker	Adhesive					152194	0.01	By Sea	Pcs.	4	2	0.0034	
Tapes	1 CM					152194	0.12	By Sea	Mtr.	0.9096	3	0.075347	
Poly Bag	01 pcs					152194	0.02175	By Sea	Pcs.	1	3	0.000058	
Gum Tape						152194	0.015	By Sea	Mtr.	8	3	0.008829	
Lock Pin	160 MM			Black		152194	0.004167	By Sea	Pcs.	1	3	0.004292	
Back Board	Back Board					152194	0.025	By Sea	Pcs.	1	2	0.0255	
Total Package Costing												0.35537	
Sewing + Trim Cost													0.48749
Financial Cost on Trims			1.00%										0.00355
Total Trim Cost													0.49104
Total Fabric + Trim Cost													2.4921

OTHER COST/ SERVICE												
Embroidery						152194			Pcs.		0	0.166667
Testing Cost						380					0	0.009167
Courier Chrg.						380					0	0.009167
Cutting						152194			Pcs.		0	
Total Service Cost												0.185001
Total Material+Others												2.67842

MARK UP													
Cut & Mark						152194			Pcs.		0	0.971577	
Total Mark Up Cost												0.971577	
TOTAL FOB PRICE													3.65

Total Sales	555508.10	100%
Cost of Fabric	301533.60	54.28%
Cost of Trims (All)	7419.05	13.36%
Other Cost	28156.04	5.07%
Financials	3757.27	0.68%
Contribution (CM)	147868.19	26.62%

CHAPTER-11 INDUSTRIAL ENGINEERING DEPARTMENT (IE)

11.1 Introduction

Industrial Engineering is a field which concerns the design improvement and installation of an integrated system of people, material, equipment, energy and technology. Industrial engineering thus concerned with bringing together and effective utilization of various resources to facilitate efficient production operation. Main objectives of industrial engineering is to find -

- The best way to do a work.
- The time required to do it.
- The way to measure results.
- The non-value added word and remove it.

The industrial engineering is necessary in apparel industry, because without thorough information regarding the plant, manager is almost powerless to take action.

11.1.1 Industrial Engineer Role

Industrial engineers can act as –

- **Expert:**
  - Helps in decision making
  - Helps in designing the system
  - Expert in new technology like ERP, TQM, MRP etc.
- **Advisor and Consultant**:
  - Interprets data
  - Reviews data
  - Advise for improvement
  - Suggests productivity tool

- **Analysist of System:**
  - Identifies system faults
  - Analysis job at micro level
  - Coordination
- **Trainer:**
  - Motivates
  - Helps in work study
  - Trains the worker in method and motion study

- Apply new technology
- Negotiator ✪ **Decision Maker:**
- Uses MIS & computers

11.1.2 Industrial Engineer Major Task

- Hunting and searching for areas for improvement, shifting those gaps into profitable projects results long-term serving.
- Realizing and achieving the financial objectives of the entire group.
- Providing creative idea in CM costing to the product development, in order to meet the cost objective.
- Monitor utilization of machinery and resources and taking initiative to put the machineries into optimum use.
- Preparing man-power forecasts for future and controlling cadre utilization in the factory.
- Standardize work methods to ensure reliability of practices.
- Assuring the functionality of the bundle system among all the areas.
- Providing accurate data to the management for control and evaluation.
- Monitor the direct labor earning and excess costs.
- Monitor direct labor ratio per activity.
- Providing economical methods and production line set ups for better line balancing and feasibility.
- Monitoring the manufacturing processes and system free of waste.
- Reporting to the Top management by means of efficiency reports, weekly and monthly reports of labor turn over etc.

11.2 Work Study

Work study is the systematic examination of the method of carrying activities, so as to input the effective use of resources and to setup standards and performance for the activities being carried out. Work study covers many management techniques, but it is defined broadly as:

1. **Method study** – The systematic recording, examination and improvement of doing work in order to develop a better method.

2. **Work measurement** – It is the name given to various techniques used to determine the time necessary for a trained worker to carry out a specific job, either at a

   "standard pace" or at "incentive pace" to an acceptable degree of quality.

11.2.1 Method Study

Method study procedure:

1. Select
2. Record
3. Examine
4. Develop
5. Evaluate
6. Define
7. Install
8. Maintain

Main purposes of method study are –

- Optimum use of plant, manpower and material
- Establish the standard of performance
- Establish the most efficient and effective utilization of human effort
- Synchronize various resources like men and machine
- Evaluate human work
- Efforts towards productivity improvement
- Eliminate of wasteful efforts, useless material handling
- Job simplification and work standardization
- Develop plant safety schemes, equipment utilization, plant layout and conducive work environment.

11.2.2 Work Measurement

Work measurement is concerned with determining the length of time it should take to complete the job. Job times are vital inputs for –

- Manpower planning.

- Reducing labor cost
- Scheduling
- Budgeting
- Designing incentive system

The most common methods of work measurement –

- Time study
- Historical times
- Predetermined data
- Work sampling

11.2.3 Time Study

A work measurement technique for recording the times and rates of working for the elements within specific conditions, and for analyzing the data so as to determine the time necessary for carrying out a job at a defined level of performance. An operator does same operation (task) throughout the day. Time study help to define how much time is necessary for an operator to carry out the task at a defined rate of performance.

Steps of time study:

1. Obtaining and recording all the information available about the job, the operator and the surrounding conditions, which is likely to affect the carrying out of the work.
2. Record a complete description of the method, breaking down the operation into elements.
3. Examining the detailed breakdown to ensure that the most effective method and motions are being used and determining the sample size.
4. Measuring with a timing device (stop watch) and recording the time taken by the operator to perform each element of the operation.
5. At the same time, assessing the effective speed of working of the operator relative to the observer′s concept of the rate corresponding to standard rating.
6. Convert the observed time (SC) into ″basic time″.
7. Determining the allowances to be made over and above the basic time for the operation.

8. Determining the "standard time "for the operation.

11.2.4 Standard Elemental Time (SET)

SET is derived from a firms own historical time study data. A time study department accumulate a file of elemental times that are common to many jobs. After a certain point, many elemental times can be retrieved from the file. This eliminate need for analysists to go through a complete time study to obtain those.

Steps:

1. Analyse the job to identify standard elements
2. Check the file for elements that have historical times and record them
3. Use time study to obtain others
4. Modify file time if necessary
5. Sum the elemental times to obtain the normal time and the standard time.

11.2.5 Work Sampling

Work sampling is a technique for estimating the proportion of time that a worker or machine spends on various activities and idle time. Work sampling doesn't require timing an activity – not even continuous observation of the activity. An observer makes brief observations of a worker or machine at random intervals and simply notes the nature of activity.

11.2.6 Predetermined Time Standards (PDTS)

PDTS involves the use of published data on standard element times. The analysist must divide the job into its basic elements, rate the difficulty and then refers to appropriate table. Standard time is obtained by adding the times for all basic elements Times are measured in

TMU (Time measurement unit)

$$1 \text{ TMU} = 0.0006 \text{ minute}$$

11.2.7 Standard Minute Value

Time taken to carry out a specific task under specific condition by a qualified worker with standard level of performance. Here the qualified worker means who has knowledge about the job, minimum educational knowledge and so.

$$SMV = Basic\ time + Allowances$$

$$Bais\ time = Observed\ time \times Rating\ Factor$$

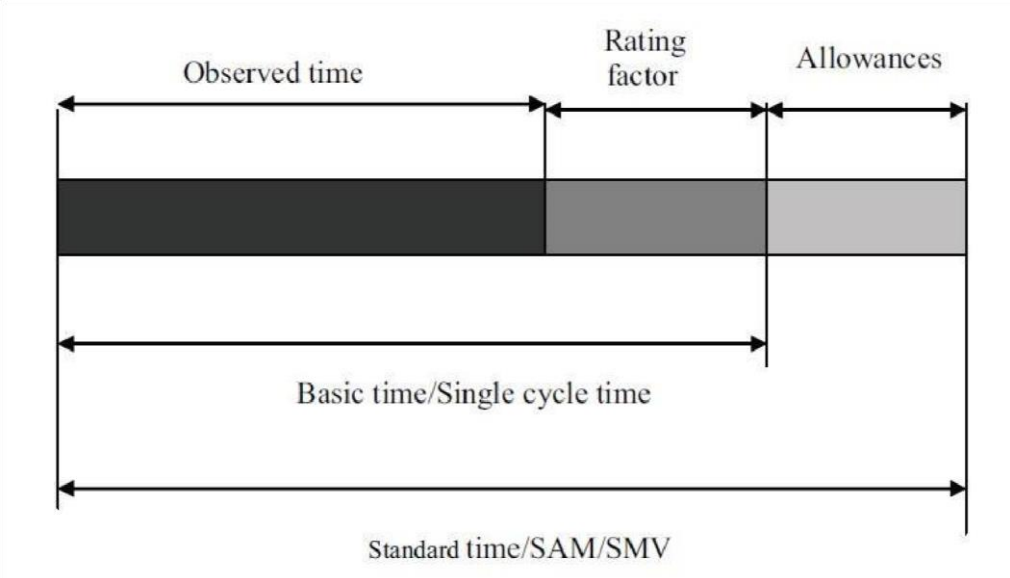


Fig. 11.1 SMV Calculation

Use of SMV:

1. To calculate the individual operator target
2. To calculate the section target
3. Efficiency calculation
4. Product costing
5. Production planning
6. Incentive level

11.2.8 Rating Factor and Allowances

Rating is the assessment of the worker's rate of working relative to the observer's concept of the rate corresponding to standard pace. It ranges between 70% to 120%.

$$Performance\ Rating = \frac{Observed\ Performance}{Normal\ Performance} \times 100$$

Table 11.1 Different allowances

Machine Allowance	Single Needle Lock Stitch – 12.5% Double Needle Lock Stitch -14% Single Needle Chain Stitch – 13% Overlock – 12 % Multi-needle Chain Stitch – 16% Safety Stitch (5OL/FL) – 18% Bar tack Stitch – 12%
Relaxation Allowance	For sitting job – 11 % For standing job – 13%
Personal Need Allowance	For male- 5% For Female – 7 %
Fatigue Allowance	Generally 4 % for both male & female
Contingency Allowance	Usually less than 5%
Bundle Handle allowance	2%

11.3 Workflow of Industrial Engineering Department

Fig. 11.2 Workflow diagram of IE department

11.3.1 Operation Breakdown

- The sequence of operations involved.
- The SAM for each operation and for the style.
- Type of machine to be used for each operation.
- Special attachments/folders to be used for each operation.
- Planned efficiency.
- Targets at planned efficiency.
- Planned line target per day.
- Manpower requirement for each operation and for the style.

Table 11.2 Operation breakdown

OPERATION BREAKDOWN											
UNIT:	4		BUYER & FILE:	C&A-3657				DATE:	19.01.2019		
LINE:	7		DESCRIPTION:	SS T-shirt							

SL	M/C	Operations	SMV	Target (100%)	Target (80%)	SMV (Seconds)	Group capacity	Takt time cap	Over Capacity or		Man Allocation	Machine Alloca	Support
									Pcs	Min			
1	M/L	Inside fabric fusing (two pcs)	0.20	300	240	12.0	300	281	19	4	1.0		
2	S/N	Back part gathering with mobilon tape	0.26	231	185	15.6	462	281	181	47	2.0	2.0	
3	S/N	Neck label tack	0.24	250	200	14.4	250	281	-31	-7	1.0	0.0	
4	B/T	Shiffon flower attach (front part)	0.40	150	120	24.0	263	281	-18	-7	2.0	2.0	
5	B/T	Front 1 pcs tassel attach	0.27	222	178	16.2	277	281	-3	-1	1.0	1.0	15 Mins Balance with Shiffon Flower
6	M/L	Fabric fusing & cut	0.24	250	200	14.4	250	281	-31	-7	1.0		
7	4O/L	1st shoulder join with tape	0.33	182	145	19.8	292	281	11	4	2.0	2.0	24 Mins Balance with 2nd Shoulder
8	F/L(S/B)	Neck binding	0.24	250	200	14.4	250	281	-31	-7	1.0	1.0	
9	S/N	Neck binding In-tack	0.24	250	200	14.4	250	281	-31	-7	1.0	1.0	
10	4O/L	2nd shoulder join	0.30	200	160	18.0	280	281	-1	0	1.0	1.0	
11	4O/L	Sleeve piping	0.43	140	112	25.8	279	281	-2	-1	2.0	2.0	
12	S/N	Sleeve piping Inside & fold tack	0.75	80	64	45.0	320	281	39	30	4.0	4.0	
13	4O/L	Side seam	0.56	107	86	33.6	321	281	41	23	3.0	3.0	
14	S/N	Neck Out ,Sleeve fold tack & Sleeve out tack & turn	0.96	63	50	57.6	250	281	-31	-29	4.0	4.0	
15	F/L(Vac)	Body turn with Bottom hem	0.48	125	100	28.8	250	281	-31	-15	2.0	2.0	
16	M/L	Final turn	0.18	333	267	10.8	333	281	53	9	1.0		
17			0.12	500	400	7.2							
	Total		**6.20**			**372**					**29.0**	**25.0**	

SUMMARY	Detail	SMV(Min)	SMV(Sec)	SUMM ARY		Particular	Min	Sec
TOTAL HEL SMV - SEWING	M/L	0.62	37.20	TOTAL OPERATOR	26	Takt time	0.2	12.8
TOTAL MC SMV - SEWING	MC	5.58	334.80	M/L	3	Line balancing		89%

TOTAL SMV		6.20	372.00	TOTAL MANPOWER	29

M/C DETAILS	Machine	M/C DETAILS	Machine	Efficiency	Target
S/N	11	B/H	0	100%	281
S/N vert	0	B/A	0	95%	267
F/L(F/B)	0	B/T	3	90%	253
F/L(S/B)	1	FOA	0	85%	239
F/L(C/B)	0	Kansai	0	80%	225
F/L(Vac)	2	H/S	0	75%	210
3O/L	0	D/N	0	70%	196
4O/L	8	O/L Blind	0	65%	182
Total Nu	mber of machine		25.0	60%	168

Prepared By:

I.E Department

Table 11.3 Machine layout

ESQUIRE KNIT COMPOSITE LIMITED

MACHINE LAYOUT

UNIT:	4			**BUYER & FILE:**			**C&A-3657**					**DATE: 19.01.2019**	
LINE:	7			**DESCRIPTION:**			**SS T-shirt**						
MC	**OPERATION**	**MC**	**SMV**	**(100TGT**	**TGT (80**	**Support**	**MC**	**OPERATION**	**MC**	**SMV**	**TGT (100**	**TGT (80%**	**Support**
29	Final turn	M/L	11	333	267		**30**						
27	Body turn with Bottom hem	F/L(Vac)	29	125	100		**28**	Body turn with Bottom hem	F/L(Vac)	28.8	125	100	
25	Neck Out ,Sleeve fold tack & Sleeve out tack & turn	S/N	58	63	50		**26**	Neck Out ,Sleeve fold tack & Sleeve out tack & turn	S/N	57.6	63	50	
23	Neck Out ,Sleeve fold tack & Sleeve out tack & turn	S/N	58	63	50		**24**	Neck Out ,Sleeve fold tack & Sleeve out tack & turn	S/N	57.6	63	50	
21	Side seam	4O/L	34	107	86		**22**	Side seam	4O/L	33.6	107	86	
19	Sleeve piping Inside & fold tack	S/N	45	80	64		**20**	Side seam	4O/L	33.6	107	86	
17	Sleeve piping Inside & fold tack	S/N	45	80	64		**18**	Sleeve piping Inside & fold tack	S/N	45	80	64	
15	Sleeve piping	4O/L	26	140	112		**16**	Sleeve piping Inside & fold tack	S/N	45	80	64	
13	2nd shoulder join	4O/L	18	200	160		**14**	Sleeve piping	4O/L	25.8	140	112	
11	Neck binding	F/L(S/B)	14	250	200		**12**	Neck binding In-tack	S/N	14.4	250	200	
9	1st shoulder join with tape	4O/L	20	182	145	24 Mins Balance with 2nd Shoulder	**10**	1tapest shoulder join with	4O/L	19.8	182	145	24 Mins Balance 2with nd Shoulder
7	Front 1 pcs tassel attach	B/T	16	222	178	15 Mins Balance with Shiffon Flower	**8**	Fabric fusing & cut	M/L	14.4	250	200	
5	Shiffon flower attach (front part)	B/T	24	150	120		**6**	Shiffon flower attach (front part)	B/T	24	150	120	

3	Back part gathering with mobilon tape	S/N	16	231	185		4	Neck label tack	S/N	14.4	250	200	
1	Inside fabric fusing (two pcs)	M/L	12	300	240		2	Back part gathering with mobilon tape	S/N	15.6	231	185	

M/C DETAILS	Machine	M/C DETAILS	Machine	SUMMARY		Efficiency	Target
S/N	11	B/H	0	TOTAL OPERATOR	26	100%	281
S/N vert	0	B/A	0	M/L	3	95%	267
F/L(F/B)	0	B/T	3	TOTAL MANPOWER	29	90%	253
F/L(S/B)	1	FOA	0			85%	239
F/L(C/B)	0	Kansai	0	TOTAL SMV	6.20	80%	225
F/L(Vac)	2	Ilet	0			75%	210
3O/L	0		0	TAKT TIME (sec)	12.8	70%	196
4O/L	8		0	LINE BALANCING	89%	65%	182
Total Number of Machine			25	Prepared By; I.E Department		60%	168

11.3.2 Efficiency and Target

$$Line\ Efficiency = \frac{Earned\ Minutes}{Available\ Mintues} \times 100\%$$

$$= \frac{Total\ output\ per\ day\ per\ line \times SMV}{Total\ Manpower\ (machine) per\ line \times Working\ hour \times 60} \times 100\%$$

$$Line\ Target = \frac{Total\ Manpower\ (machine) per\ line \times Working\ Hour \times 60}{SMV} \times Eff.$$

Line target is related to efficiency. The efficiency is set by using the learning curve.

Table 11.4 Learning Curve

Category	SMV	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Basic	< 12	35%	50%	60%	65%	70%	70%	70%	70%	70%	75%

Critical	12 to 20	30%	45%	55%	60%	65%	65%	65%	65%	65%	70%
Hard	>20	25%	40%	50%	55%	60%	60%	60%	60%	60%	65%

Note 1: If the new style is similar/repeat compared with the running one, then learning curve will start from 2nd day.

- Similar: Style is almost similar compared with the running one looking similar of both files practically.
- Repeat: Same style done in the line within the space of 1.5 month.

Note 2: If the style is totally same then there will be no change in the running days, learning curve; will start along with the running file (i.e. only file no. is changed).

11.3.3 Capacity Study and Follow Up

Capacity Study: Capacity study is similar to time study where the operator will be timed, but the purpose is not to arrive at a time standard, rather to find out the operator's potential/performance level. Here we are measuring the performance and potential that an operator should attain; if he works on the operation continuously at same pace and same method as observed during the study.

How to Perform Capacity Study:

- Get necessary details of the operation like job and machine.
- Once the best method is implemented, take ten single cycle (SC) observations with the help of stop watch.
- Once the readings are noted, calculate the average SC observation and arrive at the capacity of the operator.
- The cycle consisting of breakdown times, such as machine delay, handling bundles, etc., should not be considered for calculating average SC time during capacity study.
- The reason behind this is that the above delays will occur irrespective of the operators' capability or capacity, so these delays cannot be considered to be a measure of operator's capacity.

- However these delays will definitely reduce the operator's actual performance for the day.

Follow Up: If any bottleneck point is found in the line by measuring the capacity, a follow up is needed for that point for 30 minutes to understand the reason of bottleneck. Benefits of follow up are-

1. Improve performance (motivate)
2. Prove job quotas
3. Spot troubles

Table 11.5 Capacity Study Summary (a)

ESQUIRE KNIT COMPOSITE LIMITED							
CAPACITY STUDY SUMMARY							
Unit:	**4**		**Buyer & File:**	**C&A-3494**	**SMV:**	**6.54**	
Line	**n 1**		**Manpower:**	**26**	**DATE:**	**09.12.2017**	
Sr. no	Process	Machine	Avg Cycle time	Capacity with allowance (9%)	CL 90%	UCL 100%	LCL 75%
1	Shoulder join with tape	4O/L	21	157	215	215	161
2	Do	4O/L	30	110	215	215	161
3	Neck rib attach with folder	4O/L	13	254	215	215	161
4	Neck Rib Mea & Cut	M/L	14	236	215	215	161
5	Neck Rib Stitch Remove & Tack	S/N	46	72	215	215	161
6	Do	S/N	42	79	215	215	161
7	Do	S/N	38	87	215	215	161
8	Neck Close, loop M, & cut	4O/L	16	206	215	215	161

9	Back Neck Binding & loop make	M/L	15	220	215	215	161
10	Back Neck Binding Edge Tack	S/N	16	206	215	215	161
11	Back Neck T/S with Loop	S/N	16	206	215	215	161
12	Neck Security Tack	S/N	17	194	215	215	161
13	Sleeve hem	F/L(C/B)	14	236	215	215	161
14	Sleeve hem triming	M/L	15	220	215	215	161
15	Sleeve & body match	M/L	14	236	215	215	161
16	Sleeve join	4O/L	42	79	215	215	161
17	Do	4O/L	39	85	215	215	161
18	Do	4O/L	45	24	215	215	161
19	Care Label Att.	S/N	15	220	215	215	161
20	Side seam	4O/L	44	75	215	215	161
21	Do	4O/L	45	73	215	215	161
22	Do	4O/L	53	42	215	215	161
23	Sleeve inside tack	S/N	17	194	215	215	161
24	Sleeve outside tack & turn	S/N	18	183	215	215	161
25	Bottom Hem	F/L(Vac)	17	194	215	215	161
26	Body hem trim & Final Turn	F/L(S/B)	16	206	215	215	161

Table 11.6 Capacity Study Summary (b)

CAPACITY STUDY

SUMMARY

Unit :	**4**	**Buyer & File**	C&A-3494			**SMV:**	6.54
Line no:	**1**	**Manpower :**	26			**DATE :**	**09.12.2017**

	Process	Machine		After	CL	UCL	LCL

Sr. no			Capacity	bal+imp	90 %	100%	75%
1	Shoulder join with tape	4O/L	267	242	239	239	179
2	Neck rib attach with folder	4O/L	254	254	239	239	179
3	Neck Rib Mea & Cut	M/L	236	236	239	239	179

4	Neck Rib Stitch Remove & Tack	S/N	237	237	239	239	179
5	Neck Close, loop M, & cut	4O/L	206	206	239	239	179
6	Back Neck Binding & loop make	F/L(C/B)	220	220	239	239	179
7	Back Neck Binding Edge Tack	S/N	206	206	239	239	179
8	Back Neck T/S with Loop	F/L(C/B)	206	206	239	239	179

9	Neck Security Tack	S/N	194	194	239	239	179
10	Sleeve hem & cut	F/L(C/B)	236	236	239	239	179
11	Sleeve & body match	M/L	220	220	239	239	179
12	Sleeve join	4O/L	236	236	239	239	179
13	Care Label Att.	S/N	220	220	239	239	179
14	Side seam	4O/L	190	203	239	239	179
15	Sleeve inside tack	S/N	194	194	239	239	179
16	Sleeve outside	F/L(Vac)	183	183	239	239	179
	tack & turn						

17	Bottom Hem	F/L(Vac)	194	194	239	239	179
18	Body Final Turn	M/L	206	206	239	239	179

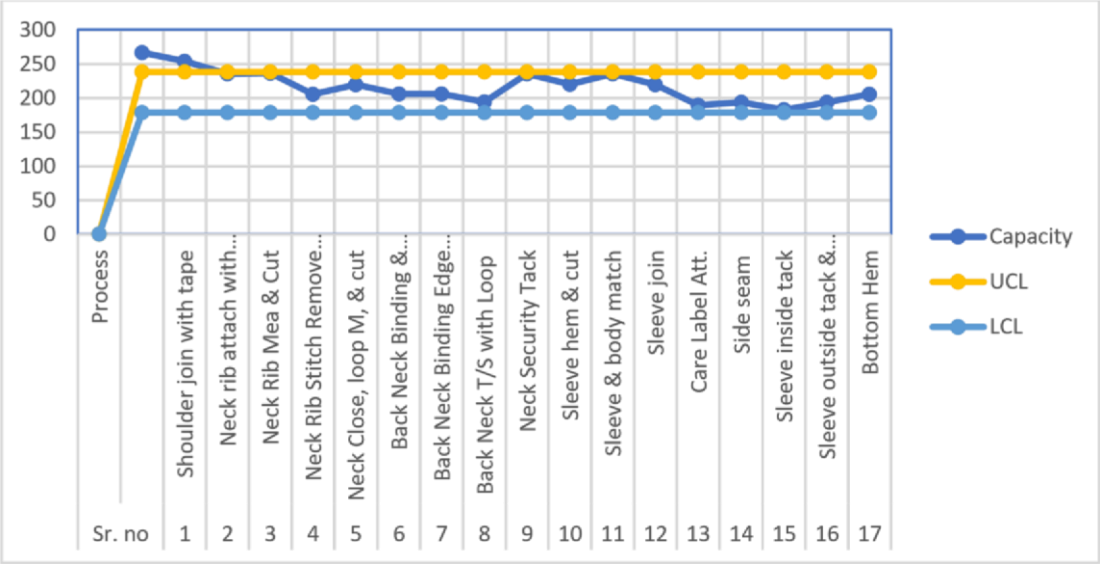


Fig. 11.3 Before Line Balancing

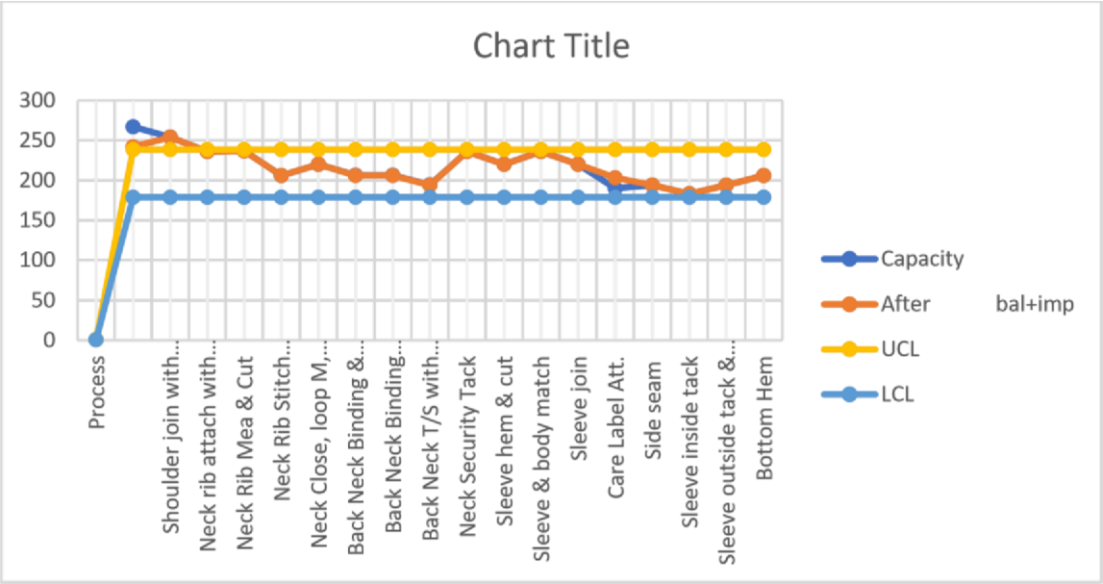


Fig. 11.4 After Line Balancing

CHAPTER-12 MARKETING ACTIVITIES

12.1 Relation between merchandising and marketing

Merchandising is the direct sales pitch to the consumer conducted in an immediate, often face to face manner. In-house consulting and sample issuance are just a few example of merchandising techniques. The goal of merchandising is to compel the consumer to buy the product. Merchandising sizes on the typically brief opportunity to sell directly to the consumer; the parties responsible to the successful merchandising include the sales person and the layout of the store itself. The sales person engages directly with the customer by providing a sales pitch or demos of the product. The layout is a store of highly influential method of merchandising: having a product directly at eye level. For example, can make the difference between the sales or the customer not seeing it and therefore walking away.

Merchandising is a subset of marketing. Marketing has several other arenas that do not overlap with merchandising. For instance, marketing also entails how to distribute the product and how best to package the item. Gathering data is another marketing field, from issuing surveys to holding consumer focus groups. Others issues includes in-house marketing. This pertains to devising strategy, assessing which price is best for the product and out lining the objectives of campaigns, promotions and other marketing endeavors.

Without other disciplines within marketing merchandising would not be effective. For example, if a company has not assessed which audience will be most desiring of the item, the business cannot effectively pitch its wares with in the retail store. Likewise, without proper analysis of how display cases boost sales or the mannerisms adopted by customer service representatives to capitalize on sales, many unrelated fields of marketing ceases to the effective. Indeed, merchandising is at the tail end of the marketing chain. While the first links include product design, packaging considerations, distribution and ad campaigns merchandising is the most time sensitive links. Business has a fleeting moment by which to persuade the consumer to take the item to the cash register.

12.2 Clients of Esquire Knit Composite Ltd.

EKCL is 100 % export oriented industry. All the goods produced in this industry are exported into various foreign countries. Name of the main buyers of this factory are given below:

- Bestseller (China)
- Bestseller (Denmark)
- Zara
- Tee Jays
- Only
- Hunkemoller
- O'stin
- Espirit
- Fynch – Hatton
- C&A
- Mascot
- Celio
- Next
- LiDL etc.

Mainly senior marketing officers, merchandiser & higher officials deal with the buyer. There are some fixed buyers of the industry. The buyers give their orders continuously all over the year. The marketing officers & the merchandisers communicate with the buying houses to collect the orders. By both side understanding, the rate & the order quantity are fixed.

CHAPTER-13 CONCLUSION

Esquire Knit Composite Limited is one of the leading garments exporting organization. One of the most attractive part of the garments is it is very well organized. We have observed throughout our training that this factory runs based on Lean Kaizen. From one side they use Lean techniques and also wants Kaizen. Esquire Knit Composite LTD. is determined to

ensure worker's right and this is a promising company who tries their best to give maximum facility to their workers.

Esquire Knit Composite Limited is sound in case of using technology. From order receiving to order fulfillment they use high quality software system for saving time and at the same time ensuring accuracy and proper monitoring so that problem can be detected as early as possible.

In conclusion, the industrial training that we had already gone through for 8 weeks at **Esquire Knit Composite Limited** was very interesting, instructive and somehow challenging for someone that has zero-working experience. It gave us lots of benefit and positive changes that enable me to enter the working environment. Through this training we were able to gain new insights and more comprehensive understanding about the real industry working condition and practice. The 8 weeks of training has provided us the opportunities to develop and improve our soft and functional skills. All of this valuable experience knowledge that we have gained were not only acquired through the direct involvement in task given but also through other aspect of the training such as work observation, interaction with the staffs and local people.

From what we have undergone, we are hundred percent agree that the industrial training program have achieve its primary objective. It is the platform to prepare for the students to face to real working life. As a result of the program, we are more confident to enter the working world and build my future career.

APPEDIX – TRAINING SCHEDULE

Table Industrial Training: 07/01/19 to 04/03/2019

Sample	04 days
Cutiing	03 days
Planning	03 day

Industrial Engineering	04 days
Garments	15 day
Embroidery	03 day
Printing	03 days
Washing	03 days
Merchandising	03 days
Knitting	04 days
Yarn Dyeing	04 days
Fabric Dyeing	04 days
Maintenance	01 day
General Discussion	01 day
Viva Voce	01 day