DAFFODIL INTERNATIONAL UNIVERSITY

Dhaka, Bangladesh

2013

Industrial Attachment

The Delta Composite Knitting Ind. Ltd (DCKIL)

Zarun (south), Kashimpur, Gazipur, Dhaka, Bangladesh.

Duration: 10th January to 10th March, 2013

Submitted to

Prof.Dr.Mahbubul Haque

Department Head of Textile Engineering
Daffodil International University

Submitted by:

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Md.Kayser Imam	**ID:092-23-1530**

ACKNOWLEDGEMENT

Firstly, we would like to pay all our regards to almighty Allah for whose grace we have successfully completed our Industrial attachment.

We are grateful to **The Delta Composite Knitting Ind. Ltd (DCKIL)** for giving us this great opportunity to intern in such supportive friendly environment. They have given us great chance to work in details.

Special thanks go to our Supervising Teacher Professor Dr. Mahbubul Haque **,Head of the** Department of Textile Engineering, Daffodil International University, Dhaka. Without whose help it would not have possible to complete the training successfully.

A number of people have made significant contributions on preparing this report. Their advice and suggestions helped us a lot. During the attachment with **The Delta Composite Knitting Ind. Ltd** we worked in all the departments.

We are grateful to **Md. Omar Faruque Siddique**, **Executive Director of DCKIL** for being so gracious to us.

We would like to express our sincere appreciation to **Director General Manager, Mr. ,** and our special thanks go to **Mr. Kabir, Senior Manager, (Knitting)** and **Senior Production Officer, Ahamed Khizir Mahbub Elahi, (Dyeing)** and Finishing for their valuable advice, cooperation, guidance, encouragement and inspiration throughout the training period.

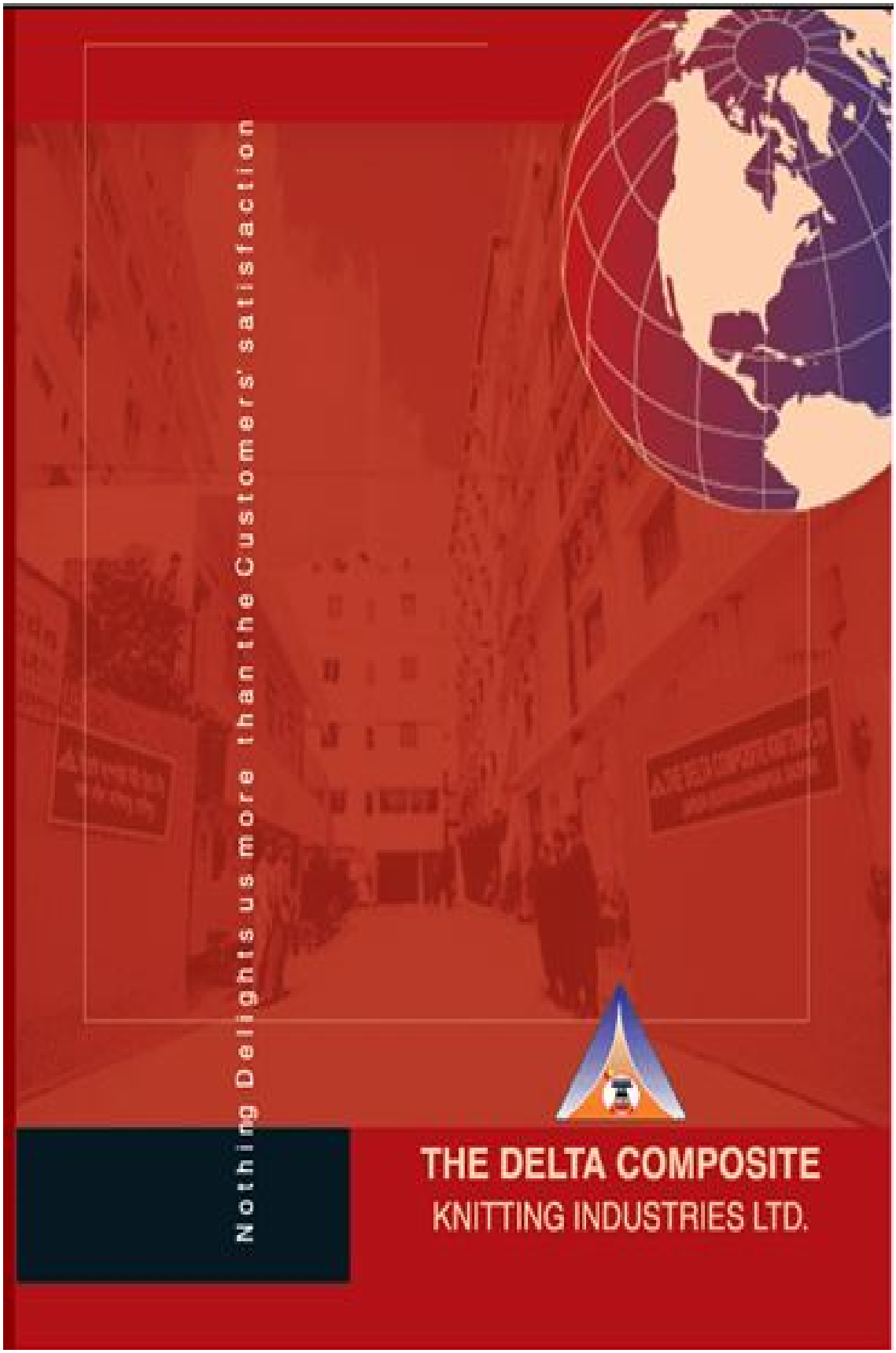
We would also like to thanks **Manager, Md. Nurul Islam, (Planning & Co-ordinator).** Thanks also to **Executive, Md. Amzad Hossain, (HR)**. as well as **The Delta Composite Knitting Ind. Ltd (DCKIL)** management, and administration & personnel for their kind co-operation.

Finally, we would like to acknowledge that we remain responsible for the inadequacies and errors, which doubtlessly remain.

INTRODUCTION

Textile and garments sector is the biggest and fastest growing sector in Bangladesh. It is also the highest foreign currency earning sector in Bangladesh. Among this sector, Knit garment is growing very rapidly due to smaller investment requirement, greater backward linkage facility & higher profit than woven garments. That's why export of knit garments is increasing steadily for last few years and up to now.

Textile education can't be completed without industrial training. Because this industrial training minimizes the gap between theoretical and practical knowledge and make us accustomed to industrial environment. I got an opportunity to complete two-months long industrial training at The Delta Knit composite**,** which is a 100% export-oriented composite Knit Dyeing Industry. It has well planned & equipped fabric dyeing-finishing and garments units in addition to facilitate knitting and knitwear manufacturing.


Nothing Delights us more than the Customers' satisfaction
THE DELTA COMPOSITE
KNITTING INDUSTRIES LTD.

Company's Business Motto

We source quality, We make quality and we deliver quality

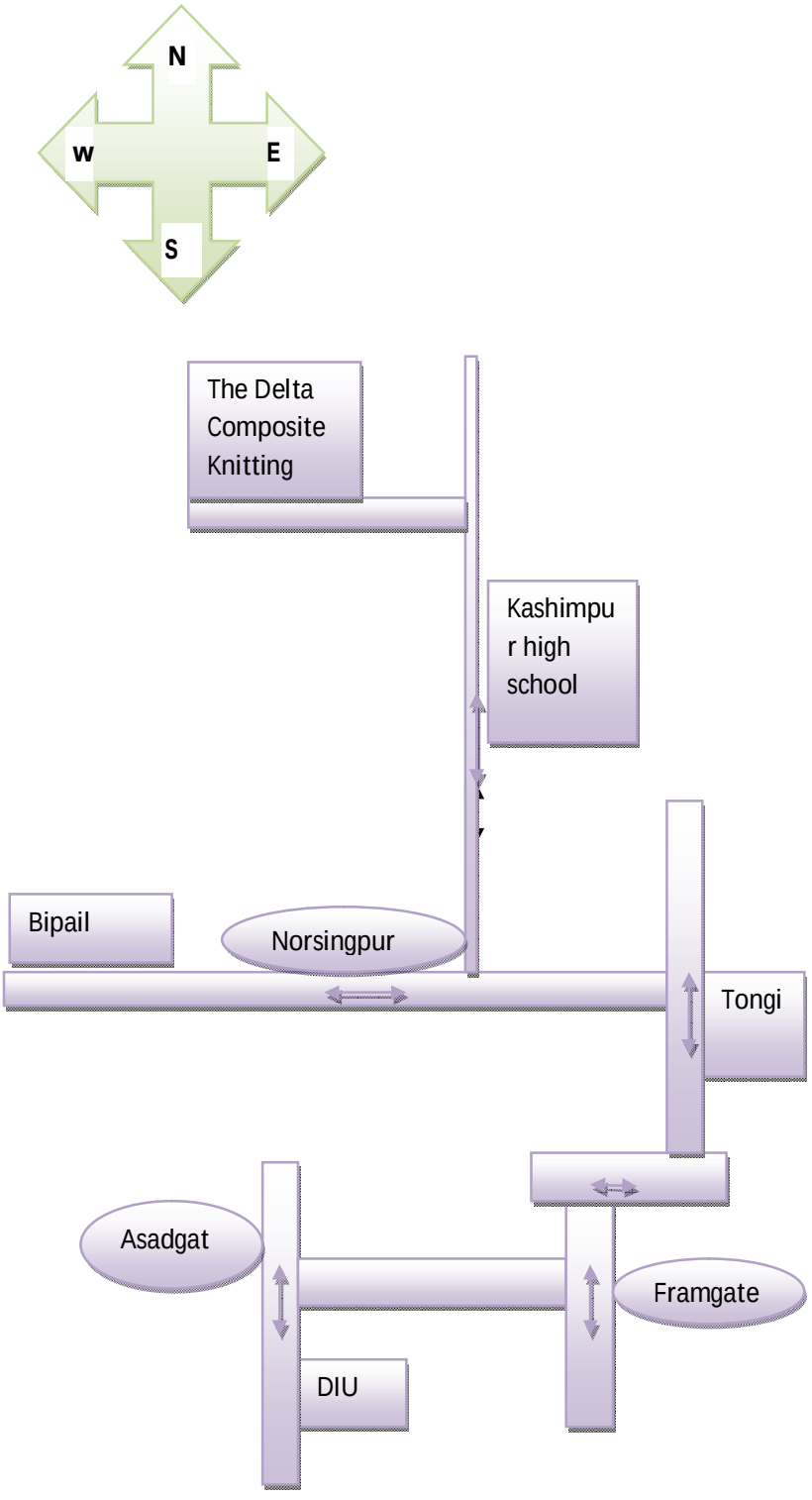
Company's Vission

Quality is always the combination of the highest intent, sincerest effort with an accurate execution.

Company's Mission

To reach the zenith or be the market leader in providing knit garments to our valued customers around the globe.

WAY FROM DIU TO THE DELTA COMPOSITE KNITTING IND. LTD:



COMPANY PROFILE

COMPANY NAME	THE DELTA COMPOSITE KNITTING IND. LTD (DCKIL)
Corporate Headquarters	House: 389, Road: 6 (East) DOHS, Baridhara, Dhaka-1216, Bangladesh Tel.:+880-2-8813636-7, 8824092 Fax : +880-2-9297746
Operational Headquarters	Zarun (south), Kashimpur, Gazipur, Dhaka, Bangladesh. Tel.:+880-2-9297652-5, 9297741-5
Factory	Zarun (south), Kashimpur, Gazipur, Dhaka, Bangladesh.
Coverage area of total factory	2,56,332 sft
Date of incorporation	January 1998.
Commercial Production	1998, Sample dyeing m/c 2 pcs, Production dyeing m/c 5 pcs, 2003 – 2 pcs production dyeing m/c, 2004 – 10 pcs dyeing m/c
Business line	Manufacturing and Marketing of high Quality Fabrics.
Listing status	Private listed company.
Authorized capital in taka	3000 million.
Paid up capital	10 millions.
Annual sales range	US $50 Million – US $100 Million
Main Market	Western Europe
Factory Equipments	Different types of Knitting, Dyeing, Cutting, Sewing, Finishing and Generator machines supplied by mostly Sweden, USA, Italy, Switzerland, Germany, Spain, Japan, China, and Turkey
Product/Service:	**T-shirt, polo shirt, tank top, jacket, long pants, ladies wear, fashion wear**
Certification Achievement :	**WRAP, ISO 9001 -2008 & OEKO-TEX-100**
E-mail	chairman@deltagroupbd.com
Web site	http://www.deltageoupbd.com

Remarks: The Delta Composite Knitting Ind. Ltd. is a well established Knit Composite Industry. The area is sufficient for the industry. But its drainage system is not very good.

Production Capacity:

Section	Capacity Per Day
Knitting	14-15 Ton
Dyeing	22-24 Ton (2 Floor)
Finishing	14-15 Ton

Major Buyers:

TERRANOVA	SAMS CLUB
TOM TAILOR	WAL-MART
ZARA	MONOPRIX
GYMBOREE	PIMKIE
KIABI	SPRINGFIELD
C&A	NEW WAVE
CARREFOUR	XANAK

Other Buyers:

MATALAN	INTEN BD
ALDIE	FOX BANGLADESH
MONDIAL	OSTIN
O,STAIN	SORBINO
XANAKA	POLICE
CUBES	CUBAS
LING&FUNG	GSS
KIABI	YAB
PIZZI ITALIA	SERJENT MAJOR
DAZ INTERNATIONAL	IMPETUS
FASHION POWER	TEAM SOURCHING
DPAM	CAMAIU
JBL FASHION	

Company Allied:

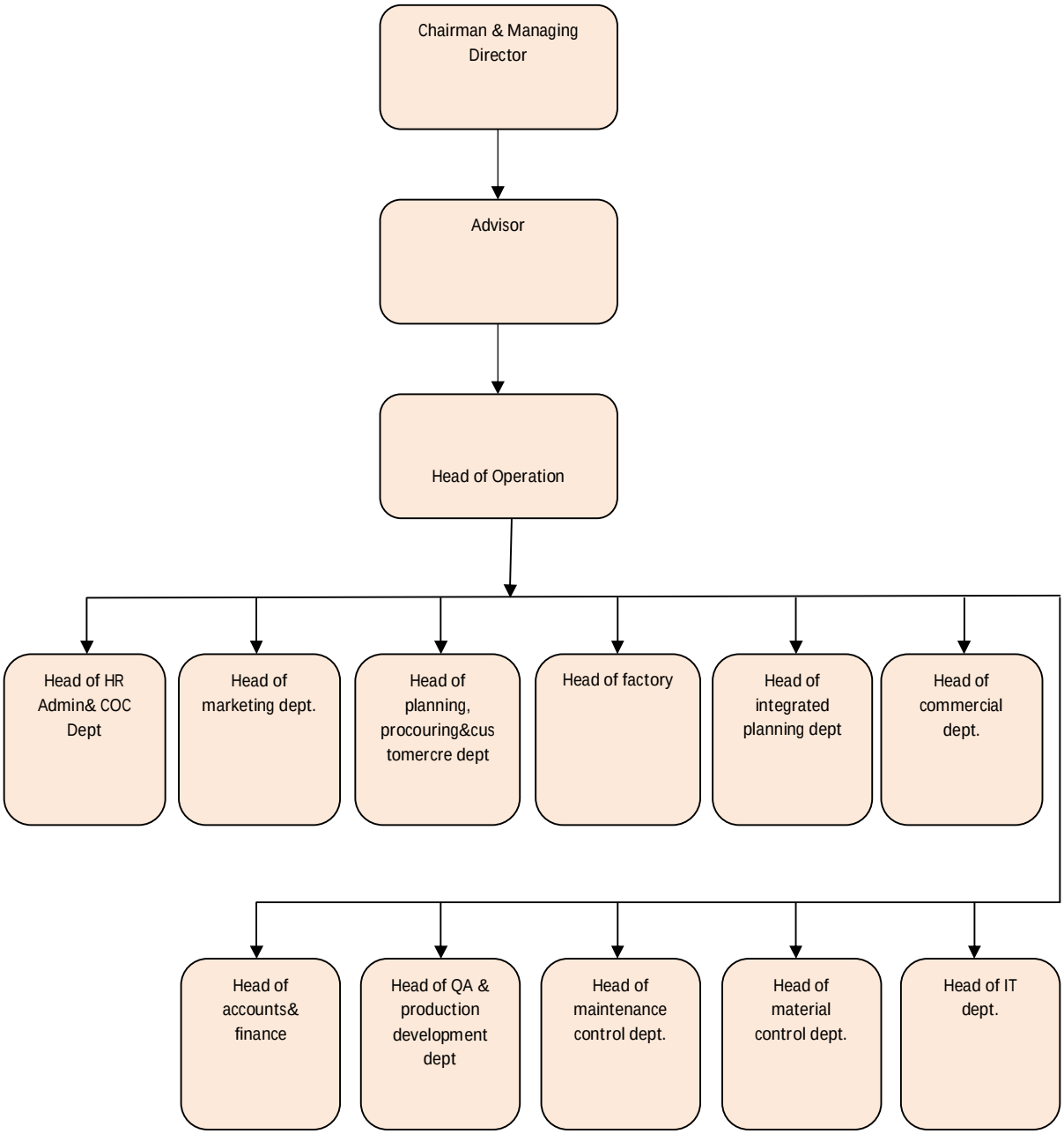
- **Lily cosmetics Ltd.**
- **The Delta Apparels Ltd.**
- **The Delta Automobiles**
- **The Delta Accessories**
- **The Delta Spinning Mills Ltd.**
- **The Delta Carton Industries Ltd.**
- **The Delta Blended Yarn Mills Ltd.**
- **The Delta Yarn Dyeing Industries Ltd.**
- **The Delta Composite Knitting Ind. Ltd.**

Certification Achievement :

WRAP, ISO 9001 -2008 & OEKO-TEX-100

(FABRICS & GARMENTS)

ORGANOGRAM:


Chairman & Managing Director
Advisor
Head of Operation
Head of HR Admin& COC Dept
Head of marketing dept.
Head of planning, procouring&cus tomercre dept
Head of factory
Head of integrated planning dept
Head of commercial dept.
Head of accounts& finance
Head of QA & production development dept
Head of maintenance control dept.
Head of material control dept.
Head of IT dept.

Management Organization Chart

Sl. No.	Marketing	Commercial	A/C & store	Production Dyeing	Production Knit	Quality	Utility	Administration
01				General Manager				
02	DGM	DGM	DGM	DGM				
03	AGM	AGM	AGM	AGM (Factory)				
04	Manager	Manager	Manager	Manager (Dyeing)	Manager (Knit)	Manager	Manager	Manager (Admin)
05	Assist manager	Assist manager	Cost Accountant	Assistant Manager	Assistant Manager	Assistant Manager	Electrical Engineer	Administration Officer
06	Sr. Executive	Sr. Executive	Sr. Executive	Sr. Prod. Engineer	Sr. Prod. Officer	QC officer	Mechanical Engineer	Sr. Executive Admin
07	Executive	Executive	Executive	Production Engineer	Asst. Production Engineer	Assistant QC Officer	Sub. Assistant Engineer	Executive Admin
08	Jr. Executive	Jr. Executive	Jr. Executive	Asst. Prod. Officer	Shift In-charge	QC In-charge	Forman	Asst. Officer Admin
09	Assistant	Assistant	Accounts Assistant	Lab. Chemist	Production Clark	Sr. QC Supervisor	Supervisor	Security Officer
10			Cashier	Sr. Lab. Assistant	Sr. Supervisor	QC Supervisor	Assistant Supervisor	Computer Operator
11			Purchase officer	Lab. Assistant	Supervisor	Assistant QC Supervisor	Sr. Fitter	Office Assistant/Time Keeper
12			Sr. Store officer	Report Clerk	Assistant Supervisor	QC	Fitter	Assistant Time Keeper
13			Store officer	Batch Incharge	Tr. Supervisor	Assistant QC	Assistant Fitter	Typist

14			Asst. Store Officer	Finish Incharge	Fitter	Tr. QC	Electrician	Telephone Operator
15			St. Store Keeper	Froman	Assistant Fitter	Tr. Assistant QC	Assistant Electrician	Delivery Supervisor
16			Store Keeper	Sr. Supervisor	Operator	QC Man	Boiler Operator	Peon
17			Asst Store Keeper	Supervisor	Assistant Operator		Boiler Assistant	Driver
18			Store Assistant	Assistant Supervisor	Tr. Operator		Generator Operator	Gardener
19			Helper Store	Tr. Supervisor	Tr. Assistant Operator		Compressor Operator	Loader
20				Tr. Asst. Supervisor	Helper		Asst. Operator	Cleaner
21				Sr. Operator			W.T.P. Attendant	Painter
22				Operator			Tr. Operator	Sweeper
23				Asst. Operator			Helper	
24				Tr. Operator				
25				Assistant Tr. Operator				
26				Helper				

Management system:

- Intercom telephone
- Fax
- E-mail
- Written letters
- Oral

Company Policy:

a. Recruitment Policy:

- Recruitment is done as per following systems.
- Serving notice/poster in important locations.
- Personal contacts by own employees.
- Head hunting for manager/executive

b. Selection:

During the selection of the workers following factors are considered:

- Good physical appearance/fitness
- Age 18 years minimum must be supported by certificate from educational institution or local govt. authorities and confirmed by medical officer.
- Educational qualification as per job profile.
- Skill ness (practical for operators).
- Wages/salary negotiation.
- Joining date.

c. Joining:

Selected workers/trainees submit the followings to personal department on joining:

- Prescribed application form duly filled.
- Two passport size photographs.
- Educational certificate.
- Experience certificate (if any).
- Medical fitness certificate mentioning age.

d. Service Confirmation:

- On completion of 3 months satisfactory job performance, company confirms the employees' service permanently.
- Trainees who fail to show satisfactory performance within this time his/her he/she cannot cope-up within this given period then his/her service is term inated**.**

e. Daily Working Hours and Over Times:

- Eight hours a day from 8.30 am to 5.30 pm with one hour lunch break (maximum 48 hours per week).
- Maximum two hours overtime per day (maximum 12 hours per week) with one-hour Tiffin break in the afternoon/evening.
- Friday is weekly holiday.

f. Medical:

Medical facilities are as follows:

- Each worker provided medical allowance @ Tk.150/= per month.
- First Aid facilities with trained first aider are available for each employee.
- Accident register for injured person is being maintained.

g. First Aid Box:

Each floor has been provided with sufficient first aid box with following items:

- **Pain relief tablets (Paracitamol).**
- **Nix.**
- **Or-Saline.**
- **Antiseptic cleaner (Savlon).**
- **Roller bandages**
- **Surgical gloves**
- **Surgical gauze.**
- **Cotton.**
- **Surgical scissors.**
- **Tourniquet.**
- **Adhesive tape (plasters).**
- **Antibacterial ointment sterile (Savlon cream).**

Other Facilities:

a. Salary & Wages:

- Salary and wages are paid to the staff and workers as per gazette notification of the government of Bangladesh.
- Payment of salary and wages are made regularly on 5 th – 7 th of each month.
- In the salary sheet basic salary, house rent, medical allowance and gross salary are shown separately for each employee.

Wages Grade: (Before 2010)

- Grade– 7 Tk.1125.00 - 1662.50 per month starting
- Grade – 6 Tk.1270.00 - 1851.00 per month starting Grade – 5 Tk.1420.00 - 2046.00 per month starting
- Grade – 4 Tk.1577.00 - 2250.10 per month starting
- Grade – 3 Tk.1730.00 - 2449.00 per month starting
- Grade – 2 Tk.2800.00 - 3840.00 per month starting
- Grade – 1 Tk.3800.00 – 5140.00 & above per month starting

b. Overtime:

- Overtime is calculated on the basis of "double the basic salary calculation of over time per hour is.
- Basic salary x 2 26 (days) x 8 (hours)
- Payment of overtime is made of 5/7 tk of each month.

c. Bonus: Two festival bonus equivalent to two month basic salary are paid to each employee, Who has completed one year of service.

d. Leave:

1. Casual: All employees enjoy 10 days casual leave in a year with full salary/wages.
2. Sick Leave: All staff & workers are entitle 7 days sick leave upon submission of medical certificate.
3. Maternity Leave: Female employees are entitled to enjoy 12 weeks (6 weeks before & 6 weeks after delivery) maternity leave with 100% salary/wages.
4. Earn Leave: For adult worker, 1 day leave for 22 days of work (but they have to work minimum 1 year for the entitlement).
5. Festival Leave: 10 days per calendar year.

Promotion: Performance based promotions or After 3 year's auto promotions

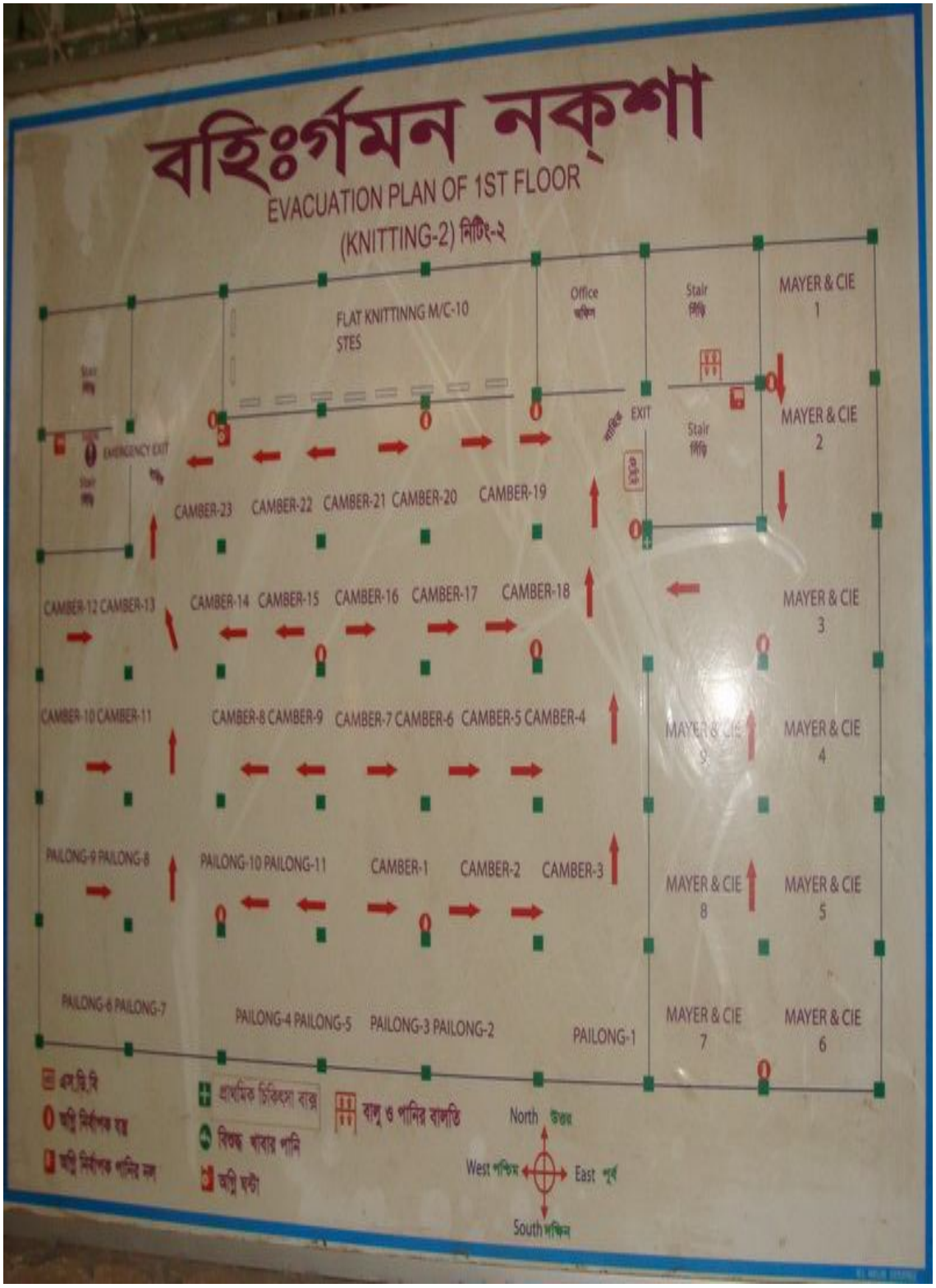
Safety: Compliance department handle this criteria

Conflict Management: Situation demandable

Admin: Transport, Canteen, Security, Disciplinary control.

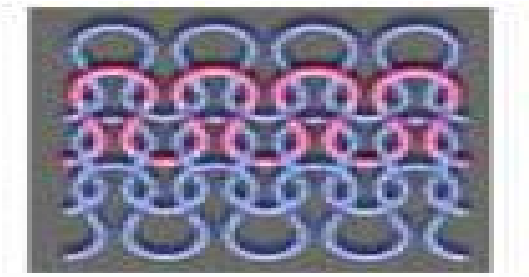
(Knitting Department)

Section Layout:

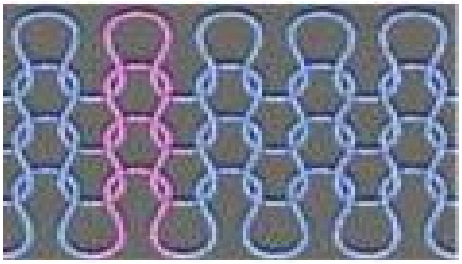


PROCESS DEFINITION (KNITTING):

Knitting is considered to be the second most frequently used method of fabric construction, after weaving. It is one of the several ways to turn thread or yarn into cloth. It is similar to crochet in the sense that it consists of loops pulled through other loops. In other words, knitting is the process of construction of a fabric made of interlocking loops of yarn by means of needles. The loops may be either loosely or closely constructed, according to the purpose of the fabric. The loops or stitches are interlocked using a needle which holds the existing loop and a new loop is formed in front of the old loop. The old loop is then brought over the new loop to form the knitted fabric. Knitting is different from weaving in the sense that a single piece of yarn can be used to create fabric. The knitted fabric consists of horizontal rows known as **courses** and vertical columns of loops known as **Wales**.



Course wise

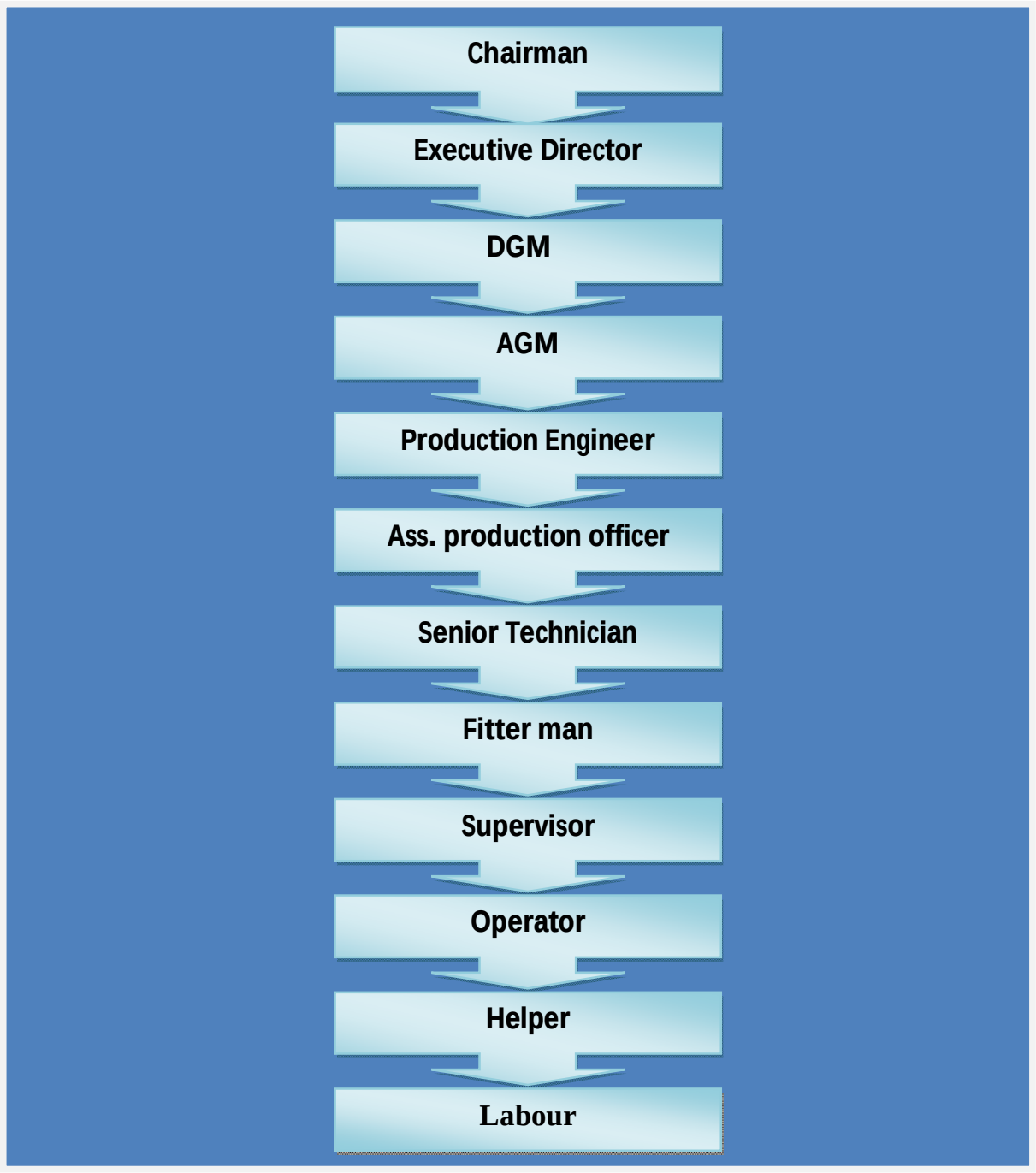


wale wise

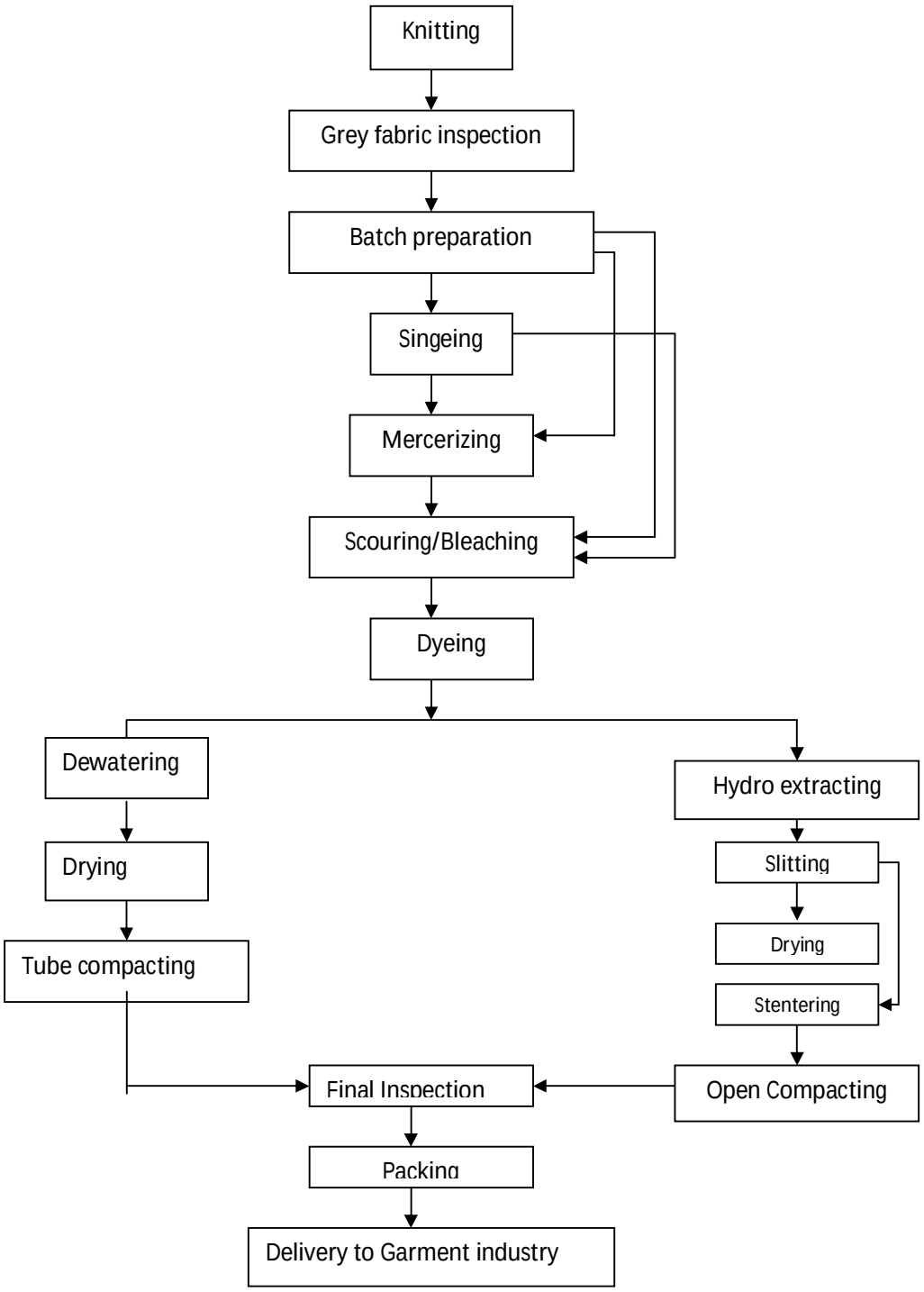
Today, knitting is practiced manually, or with the help of machines. Knitted fabric has certain special characteristics that make it suitable for creating a wide range of garments and accessories like tights, gloves, underwear and other close-fitting garments. The structure of the loop of knitted fabric stretches and molds to fit body shapes. The air trapped by the interlocking loops keeps the wearer warm. The popularity of knitting has grown a lot within the recent years owing to the adaptability of various man-made fibers, the increased versatility of knitting techniques and the growth in demand for wrinkle-resistant, stretchable, snug-fitting fabrics (particularly in the range of sportswear and other casual apparels). Today, knitted fabrics form an integral part of hosiery, underwear, slacks, sweaters, suits and coats, rugs and other home furnishing items. Knitting industry has two main divisions: One division produces knitted goods for apparel manufacturers, for sewing centers, for consumers and for others. Other division produces completed apparel like hosiery, sweaters and underwear**.**

ORGANGRAM OF KNITTING SECTION:

Following organ gram are found in knitting section in DCKIL..



SEQUENCE OF OPERATION:



RAW MATERIALS OF KNITTING SECTION IN MKL:

Yarn:

Types of Yarn	Usable Yarn Count
100% Cotton Yarn	10/1 KC
	12/1 KC
	30/2 KC
	40/2 KC
	20/1KC
	22/1 KC
	26/1 KC
	26/1 CC
	26/1 Dyed
	28/1 KC
	28/1
Core Yarn	30/1 CC
	30/1 KC
	32/1 Core
	34/1 CC
	34/1 KC
	40/1 CC
	40/1 Core
PC	26/1 PC
	28/1 PPC
	30/1 PC
	34/1 PC

Mélange	**Eqru Melange: Viscose 1-2%**
	Grey Melange: Viscose 5-15%
	Anthra Mélange: Viscose 75%
CVC	**20/1 CVC**
	26/1 CVC
	30/1 CVC
Polyester	**150 D Bright Poly**
	150 D Dull Ploy
	75 D Bright Poly
	75 D Dull Poly
Lycra	**20 D**
	40 D
	70 D

Different Brand of Lycra Yarn:

1. Lycra.
2. Aclon.
3. Dupont.
4. Elaspan.
5. Toplon.
6. Texlon.
7. Creora.
8. Korea.
9. Spandex.

Yarn Come From:

1. Padma Spinning Mill (Beximco).
2. Advance Spinning Mill.
3. Square Yarn Mill.
4. Beximco Synthetics Ltd.

Needle:

1. Gorz Beckert-Germany.
2. Sagura-Japan.
3. Yantex-Japan.
4. Organ

Cam:

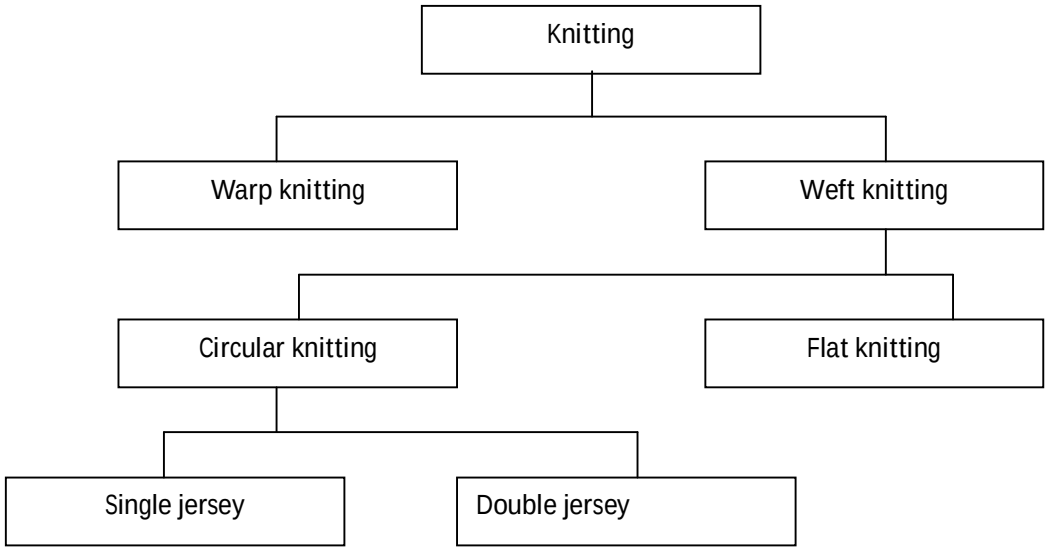
1. Kern Lever-Germany.
2. Christop Lever-Germany.

Lubrication Oil:

1. BP-22 (Needle Oil).
Origin-Germany.

2. BP-60 (Base Oil).
Origin-Germany.

CLASSIFICATION OF KNITTING SECTION:



CIRCULAR KNITTING SECTION:

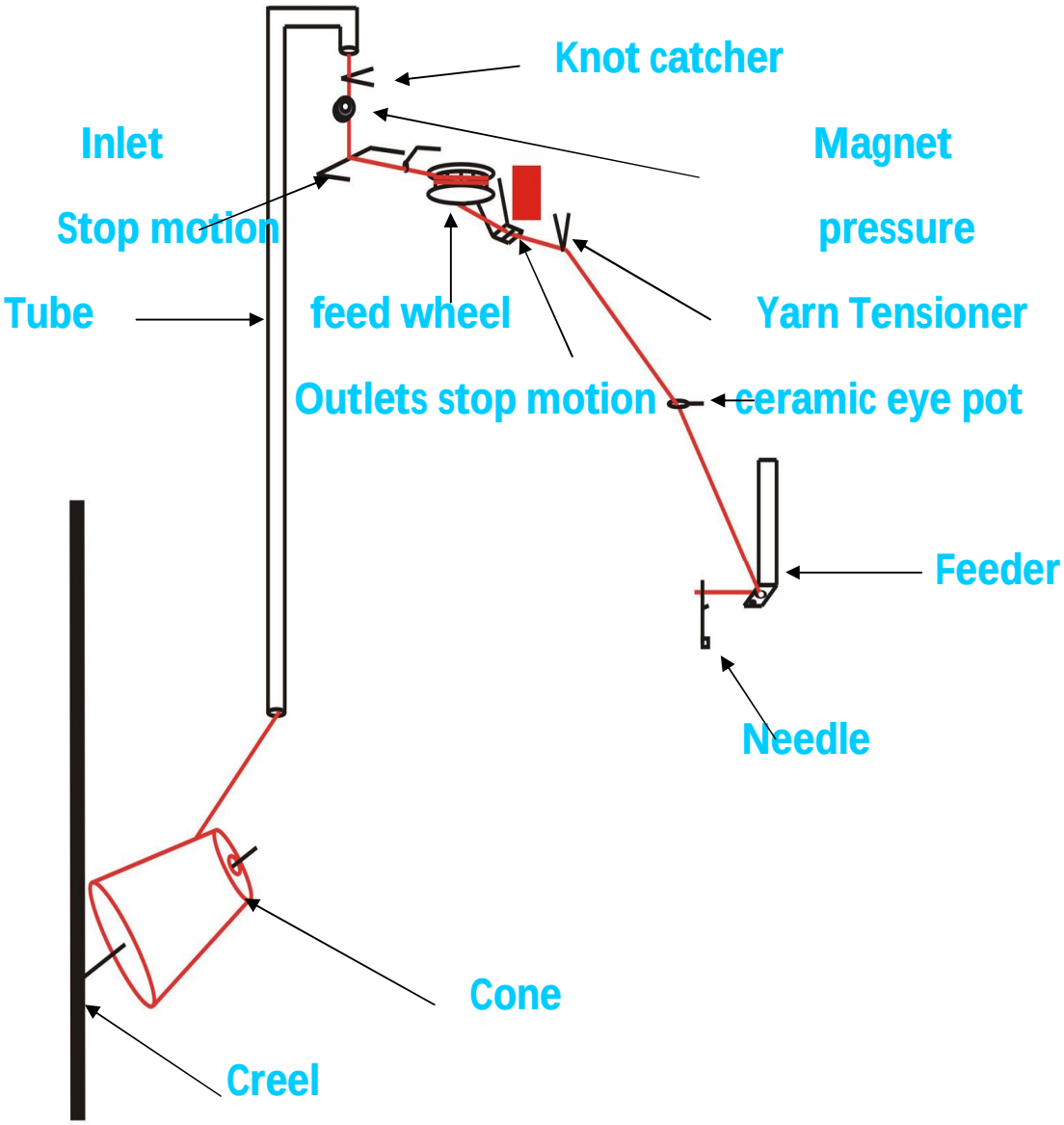
Circular knitting machine is widely used throughout the knitting industry to produce fabric. This machine can be built in almost any reasonable diameter and the small diameter of up to five, which are used for wear.

Machine for outerwear and under wear may vary from 12 inch to 60 inch in diameter according to manufactures requirement. This machine can be used either as fabric or for making garments completely with fancy stitch. Latch needles are commonly employed in all modern circular machines because of their simple action and also their ability to process more types of yarns.

Plain circular machine uses only one sets of needles, circular rib machine uses two sets of needles i.e. Cylinder needle and Dial needle, the interlock circular knitting m/c also uses two sets of needles by needles are long and short respectively for both dial and cylinder, that is why multiple design and thick fabric can be produce with that machine. That machine is also called double Jersey machine.

Photo: Knitting Machine.

YARN PATH FROM CREEL TO NEEDLE:



PASSES OF YARN IN CIRCULAR KNITTING MACHINE:

Creel

Cone

Tube

Knot Catcher

Magnet Pressure

Sensor

Ceramic Eye Pot

Yarn Wheel

Guide

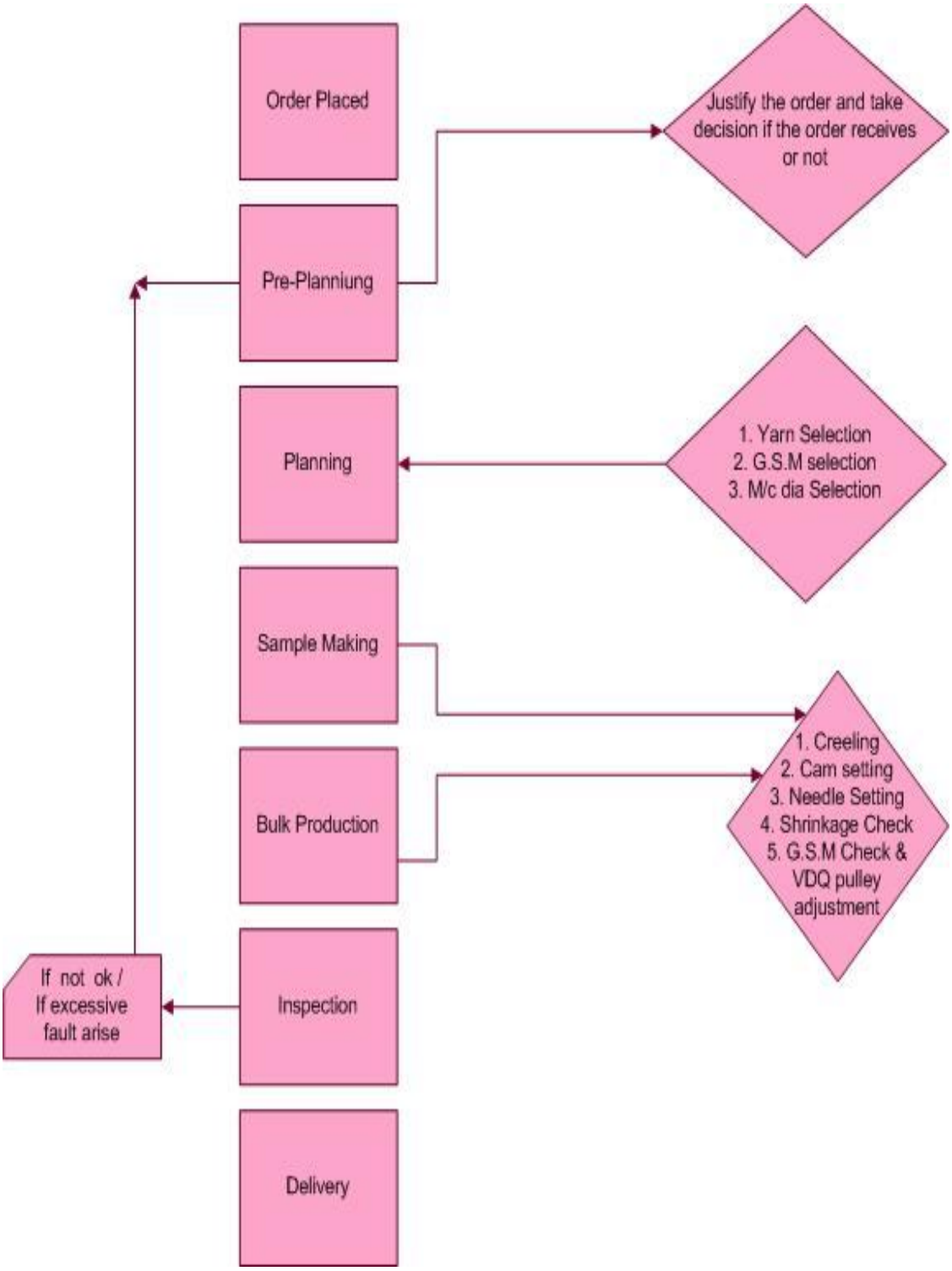
Sensor

Guide

Ceramic eye pot (Feeder Ring)

Feeder

2.8 PRODUCTION FLOW CHART



2.9 PRODUCTION FLOW CHART OF KNITTING SECTION:

Sample fabric

↓

Design analysis

↓

Machine selection

↓

Setting the machine for the specific design

↓

Sample Knitting

↓

Sample approval

↓

Bulk Production

↓

Grey fabric inspection

2.10 DESCRIPTION OF PRODUCTION PROCESS:

1. Firstly, knitting manager gets a production shit from the merchandiser as accordance as consumer requirements then he informs or orders production officer about it.
2. Production officer informs technical in charge and knows about machine in which the production will be running.
3. Technical in charge calls for leader of mechanical fitter troops, they two take decision about machine for production considering machine condition, production capacity, maintenance complexity, etc.
4. Production officer with experienced mechanical fitter adjusts required stitch length and grey GSM for required final GSM.
5. Supervisor checks daily production regularity and make operator conscious about finishing tin due time.
6. Operators operate machine in high attention as if there were no faults in the fabrics. If he thinks or sure about any fabric fault, then he calls for the mechanical fitters in duty. Mechanical fitter then fixes it if he can or he informs technical in charge. Then he comes in spot.
7. After required production and final inspection in 4-point system, they sent in dyeing section.

2.11 PRODUCTION PARAMETER:

- Machine Diameter;
- Machine rpm (revolution per minute);
- No. of feeds or feeders in use;
- Machine Gauge;
- Count of yarn;
- Required time (M/C running time);
- Machine running efficiency

2.12 Method of Increasing Production:

1. By increasing m/c speed:

Higher the m/c speed faster the movement of needle and ultimately production will be increased.

2. By increasing the number of feeder:

If the number of feeder is increased in the circumference of cylinder, then the number of courses will be increased in one revolution at a time.

3. By using machine of higher gauge:

The more the machine gauge, the more the production is. So by using machine of higher gauge production can be increased.

4. By imposing automation in the m/c:

a) Quick starting & stopping for efficient driving system.

b) Automatic m/c lubrication system for smoother operation.

c) Photo electric fabric fault detector.

5. By imposing other developments:

a) Using creel-feeding system.

b) Applying yarn supply through plastic tube that eliminates the possibilities of yarn damage.

c) Using yarn feed control device.

d) Using auto lint removal.

2.13 Necessary Information:

1. **G.S.M.:** It is technical term that indicates the weight of the fabric per square meter.

Points that should consider in case of g.s.m. changing:

a) VDQ (Variable Dia. Quality Control) pulley diameter.

b) Yarn count.

c) M/C gauge.

d) Cam position

e) Take up motion

2. **Factors that should be considered for changing of fabric design on:**

a) Cam arrangement changing.
b) Needle butt setting & needle dropping.
c) Using of different colors in selected feeder.
d) Using of jacquard mechanism.
e) Size of the loop shape

3. **Gauge numbers that are usually seen in different m/c:**

i) Incase of rib m/c. 16 to 18 G are normally used. But incase of improved quality yarn 20G M/s are used in European country.

ii) Single jersey m/c is normally found 20, 24,28etc. Gauges.

4 .Stitch length:

GSM control means control the stitch length of the knitted fabric. Larger stitch length/loop length produces lower GSM & smaller stitch length/loop length has higher GSM.

Stitch length is the average length of yarn in a knitted stitch.

$$\text{i.e. stitch length} = \frac{Course\ length}{Total\ \ number\ \ of\ \ needle}$$

2.14 Knitting Variable

Yarn count: - Yarn count indicates the fineness of yarn. It varies according to weight with length of the yarn.

1. **Yarn twist: -** It is the torsion of yarn which helps the fibers to ad hear with each other.
2. **Spinning system: -** This is the systematic way of giving torsion to the fibers.
3. **Yarn ply: -** It is the number of ply of the yarn which depends on the required gsm of the fabric.
4. **Stitch length:** - It is the length of the yarn which forms a single loop in a knitted fabric. If stitch length is increased, fabric gsm is decreased & vise versa.
5. **Yarn tension: -** It is the given tension on the yarn during feeding in circular knitting machine. It depends on the required gsm of the fabric. If yarn tension is increased, then stitch length is decreased and fabric gsm is increased. And if yarn tension is decreased, then stitch length is increased and fabric gsm is decreased.
6. **Take down tension: -** It is the tension created by increasing fabric take up roller speed.
7. **Yarn quality: -** Fabric quality depends on the yarn quality. As for example, for producing slub single jersey we need slub yarn.
8. **Machine gauge: -** It the number of needle in one inch area of a cylinder.
9. **G.S.M (gm/m^2):** For knitting it is the main parameter. It is controlled by loop length. If loop length increases GSM will decrease and vice versa. It is measured by GSM cutter & electric balance. It may also be calculated as below.

The Delta Composite Knitting Ind. Ltd.

Zarun (South), Kashimpur, Gazipur.

TOTAL MACHINE = 61 SETS

SINGLE JERSEY MACHINE = 37 SETS

2.15 MACHINE SPECIFICATION:

SL.NO	MACHINE NAME	COUNTRY ORIGIN	MACHINE DIAMETER	MACHINE GAUGE	TYPE OF MACHINE	M/C QUANTITY	MACHINE FEEDERS	REMARKS
1	**Camber**	**England**	**19 Inch**	**24**	**Lycra Att. Single Jersey**	**1**	**57**	**Old**
2	**Mayer**	**Germany**	**22 Inch**	**24**	**Lycra Att. Single Jersey**	**1**	**69**	**Old**
3	**Mayer**	**Germany**	**24 Inch**	**24,28**	**Lycra Att. Single Jersey**	**2**	**78**	**Old**
4	**Mayer**	**Germany**	**26 Inch**	**20, 24**	**Lycra Att. Single Jersey**	**1**	**84**	**Old**
5	**Camber**	**England**	**27 Inch**	**20, 24**	**Lycra Att. Single Jersey**	**1**	**81**	**Old**
6	**Camber**	**England**	**28 Inch**	**20, 24**	**Lycra Att. Single Jersey**	**1**	**84**	**Old**
7	**PAILUNG**	**TAIWAN**	**30 Inch**	**20, 24,**	**Lycra Att. Single Jersey**	**4**	**90**	**New**
8	**PAILUNG**	**TAIWAN**	**30 Inch**	**20, 24,**	**Lycra Att. Single Jersey For Open**	**1**	**90**	**New**

9	**Mayer**	**Germany**	**30 Inch**	**20, 24, 28,**	**Lycra Att. Single Jersey**	**2**	**96**	**Old**
10	**PAILUNG**	**TAIWAN**	**32 Inch**	**20, 24,**	**Lycra Att. Single Jersey**	**2**	**96**	**New**
11	**PAILUNG**	**TAIWAN**	**34 Inch**	**20, 24,**	**Lycra Att. Single Jersey**	**3**	**102**	**New**
12	**PAILUNG**	**TAIWAN**	**34 Inch**	**20, 24,**	**Lycra Att. Single Jersey For Open**	**2**	**102**	**New**
13	**PAILUNG**	**TAIWAN**	**34 Inch**	**20, 24, 28,**	**Lycra Att. Single Jersey**	**3**	**102**	**Old**
14	**PAILUNG**	**TAIWAN**	**36 Inch**	**20, 24,**	**Lycra Att. Single Jersey**	**4**	**108**	**New**
15	**PAILUNG**	**TAIWAN**	**36 Inch**	**20, 24,**	**Lycra Att. Single Jersey For Open**	**2**	**108**	**New**
16	**PAILUNG**	**TAIWAN**	**36 Inch**	**20, 24, 28,**	**Lycra Att. Single Jersey**	**3**	**108**	**Old**
17	**PAILUNG**	**TAIWAN**	**38 Inch**	**24**	**Lycra Att. Multi Feeder For Open**	**2**	**180**	**New**
18	**LISKY**		**60" Inch**	**20, 24, 28,**	**Lycra Att. Multi Feeder For Open**	**2**	**360**	**New**

Rib & Interlock Machine = 21 Sets

SL.NO	MACHINE NAME	COUNTRY ORIGIN	MACHINE DIAMETER	MACHINE GAUGE	TYPE OF MACHINE	M/C QUANTITY	MACHINE FEEDERS	REMARKS
19	Mayer	Germany	30 Inch	18	Lycra Att. Rib	2	62	Old
20	Mayer	Germany	34 Inch	16,18	Lycra Att. Rib	1	71	Old
21	PAILUNG	TAIWAN	34 Inch	18	Lycra Att. Rib	1	71	Old
22	PAILUNG	TAIWAN	34 Inch	18,22	Lycra Att. Rib/Interlock	1	72	Old
23	Mayer	Germany	34 Inch	18,22	Lycra Att. Rib/Interlock	1	70	Old
24	Mayer	Germany	36 Inch	18,22	Lycra Att. Rib/Interlock	5	74	Old
25	Mayer	Germany	38 Inch	18,22	Lycra Att. Rib/Interlock	3	78	Old
26	PAILUNG	TAIWAN	40 Inch	18,22	Lycra Att. Rib/Interlock	2	80	Old
27	PAILUNG	TAIWAN	42 Inch	18,22	Lycra Att. Rib/Interlock	2	84	Old
28	Mayer	Germany	30 Inch	22	Interlock	2	96	Old
29	Mayer	Germany	34 Inch	22,24	Interlock	1	108	Old

Three End Fleece Machine = 5 Sets

SL.NO	MACHINE NAME	COUNTRY ORIGIN	MACHINE DIAMETER	MACHINE GAUGE	TYPE OF MACHINE	M/C QUANTITY	MACHINE FEEDERS	REMARKS

30	**PAILUNG**	**TAIWAN**	**30 Inch**	**20**	**Conversion Kit for Three End Fleece**			
31	**Camber**	**England**	**30 Inch**	**20**	**Lycra Att. Three End Fleece**	**3**	**90**	**Old**

Collar Machine = 25 Sets

SL.NO	MACHINE NAME	COUNTRY ORIGIN	MACHINE DIAMETER	MACHINE GAUGE	TYPE OF MACHINE	M/C QUANTITY	MACHINE FEEDERS	REMARKS
32	**Matusa**	**Japan**	**39 Inch**	**14**	**Flat Knit Collar**	**10**	**4**	**Old**
33	**Pailung**	**Taiwan**	**80 inch**	**114**	**Flat Knit Collar**	**15**	**2F**	**New**

2.16 Relation between Grey GSM & Finished GSM

Finish process/ Color shade %	(%) Percent increase/ decrease
1) White	15% to 18% increase
2) Light color (0.5% – 2%)	18% to 20% increase
3) Medium color (2% - 3.5%)	20% to 23% increase
4) Deep color (3.5 %– 6%)	23% to 25% increase
5) Extra deep (6%- 9%)	25% to 30% increase

2.17 Relation between Finish GSM & Yarn Count (S/J)

Finished G.S.M.	Count (Ne)
160-180	**34/s**
180-200	**30/s**
200-220	**28/s**
220-235	**26/s**
235-245	**24/s**

2.18 Relation between Finish GSM & Yarn Count (D/J Interlock)

Finished G.S.M.	Count (Ne)
180-200	**40/s**
200-220	**34/s**
220-240	**30/s**
240-260	**28/s**
260-280	**26/s**

2.19 Relation Between Fabric Diameter And Machine Diameter

Count	Finish GSM	Grey fabric diameter increases then machine diameter
30	**142**	**5-8%**
28	**155**	**8-12%**
26	**165**	**12-15%**
24	**180**	**15-20%**
20	**200**	**20-25%**

2.20 Yarn Count Used According To Grey Gsm

Name of required fabric	Grey gsm	Finish gsm	Yarn count	Stitch length(mm)	Lycra count(D)	Machine gauge	Machine diameter
Single jersey	90	90	50/s cc	2.45		24	30
Single jersey	105	120	36/s cc	2.61		28	30
Single jersey	145	160	26/s cc	2.77		28	30
Single jersey	185	200	20/s cc	2.90		20	30
Single jersey	260	275	30/2 kc	3.10		18	30
Single jersey	135	150(silicon finish)	28/s kc	2.62		24	30
Single jersey (3% viscose)	165	180(after wash 190-200)	24/s kc	2.74		20	30
Slub single jersey(organic cotton)	100	110	40/s	2.61		24	34
Lycra single jersey	175	190	34/s cc	3	20	24	30
A/Stripe single jersey	195	210(after peach finish)	18/s cc	2.96		20	26
Multi feeder single jersey	195	"	20/s cc	3		24	36
STBPQ	165	180	28/s pc	2.55		24	30
STBPQ	185	200	24/s kc	2.68		24	30

STBPQ	215	230	20/s kc	2.96		24	30
Y/D STBPQ	210	220	18/s kc	3.10		20	30
Suede jersey	265	280	30/2 kc	3.10		18	30
Lycra fleece	245	260/270	30/s cc	2.8	20	24	30
Lycra Twill fleece	210	220	34/s cc	3.05	75/D poly	24	30
Frency	245	260	20/s kc	3.10		20	30
Lycra F/Terry	225	240	30/s cc	2.80	20	24	30
1×1 Normal Rib	210	220	28/s cc	2.70		18	30
H/F Lycra 2×1 Rib	385	400	20/s kc	2.87	70	18	40
2×1 Rib	225	240	24/s kc	2.75		18	30
Polo PQ	185	200	26/s	2.60		24	30

2.21 Different parts of Circular Knitting machine:

Latch needle: This type of needle has a special sliding latch with other common features. This part is used to form loops.

Cams:

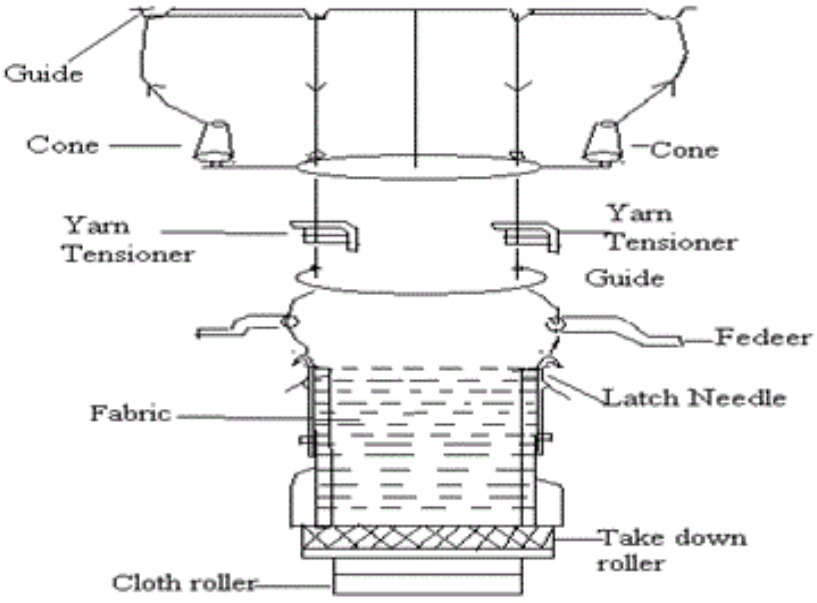
There are three types of cams:

a. Knit cam: This cam helps needle to form knit loops.

b. Tuck cam: This cam helps needle to form tuck loops.

c. Miss cam: This cam helps needle to form miss loops.

Yarn path diagram of single jersey circular knitting machine:



Sinker:

There are three types of sinkers:

a. Loop forming sinker: This sinker is used to sink or kink the newly laid yarn.

b. Holding down sinker: This sinker is used to hold down the old loops.

c. Knocking-over sinker: This sinker supports the old loop as the new loop is drawn through it.

Feeding unit :

A feeder supplies yarn to needles. A positive feeder contains the following parts:

a. Knot catcher: This part finds any fault in yarn.

b. Yarn tensioner: This part gives proper tension to yarn for proper knitting.

Timing belt / Tooth belt:

This part helps machine to stop immediately.

VDQ Pulley: This part is used to control stitch length of the knitted fabric.

Cylinder: This frame contains needles, cams, jacks and sinkers.

Sinker Ring: Sinkers are placed on the sinker cam in the sinker ring.

Needle Detector: This part detects the any type of faults of needles.

Fabric Detector: This part detects any fault of fabric.

Adjustable Fan: This part removes lint, hairy fibre from yarn and others.

Take up Roller: This part is used to take up the fabric from cylinder.

Cloth Roller: The final product i.e. cloth is wound on this roller.

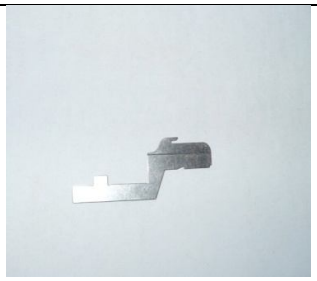
Expander: This part is used to control the width of fabric.

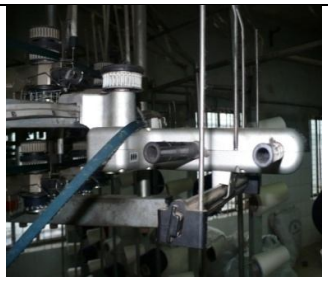
Creel: This part is used to contain yarn packages.

2.22 Description Of Knitting Parts With Figure

Name of the parts	Picture	Function
Creel		Creel is a part of knitting machine. Here yarn packages are stored for yarn feeding in the machine.
MPF Wheel		Its control the speed of the MPF. Pulley belt gives motion to the wheel.
MPF		It's mean Mamminger positive feed. It gives equal length yarn distribution in the knitting cycle.
VDQ Pulley		It is a very important part of the machine. It controls the quality of the product. Altering the position of the tension pulley changes the G.S.M of the fabric. If pulley moves towards the positive directive then G.S.M decreases and reverse direction G.S.M will increase

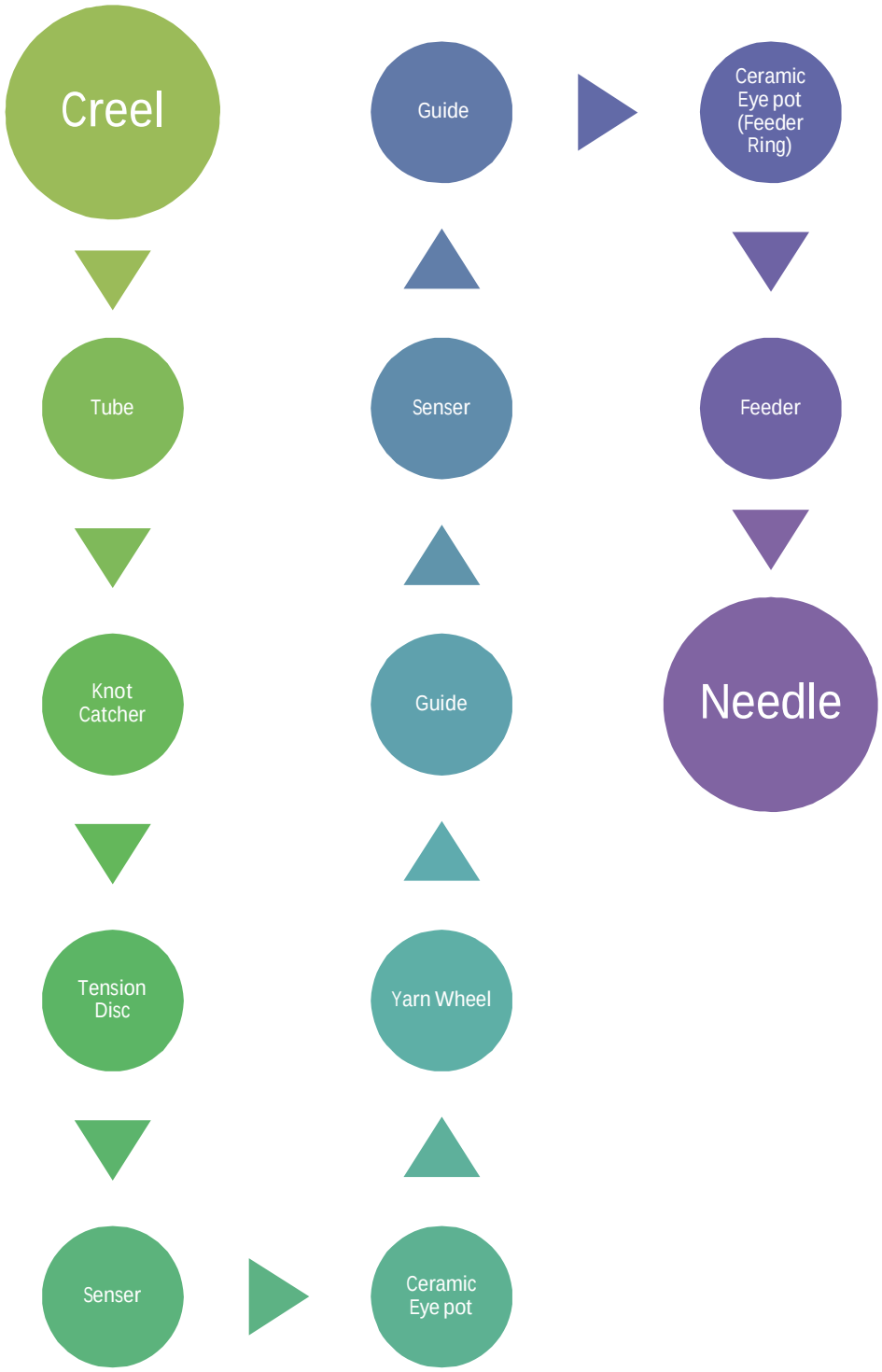
Pulley belt		It controls the rotation of the MPF wheel.
Yarn guide pipe		It helps the yarn to feed in the feeder & also reduce ply.
Inlet & outlet stop motion		It is an important part of the machine. It stops the machine instantly when a yarn breaks.
Feeder ring		It is a ring where all feeders are place together.
Feeder		Feeder is a device where yarn passes through the knitting section.

Brush		It cleans the pulley belt.
Sinker		It is most important element of the machine. It helps to loop formation, hold down the loop, knocking over the loop.
Sinker ring		It is a ring where all sinkers are placed together.
Cam		Cam is a device which converts rotary machine drive into a suitable reciprocating action for the needles and other elements. The cams are carefully profiled to produce precisely-time movement and dwell periods and are two types, engineering and knitting cams.
Cam box		Where cam are placed horizontally in the box.

Needle		Needle is a primary knitting elements. It gives movement according to the cam arrangement.
Cylinder		Needle track are situated here.
Needle trick		Where all needles are placed in a decent design.
Lycra attachment		Lycra is placed here and feeding to the machine.
Lycra stop motion		When lycra is broken it stops the machine.

Screen		It is a digital screen. Which show the all machine information and we can get command to the machine.
Automatic oiler		It gives the machine oil all the time properly and automatically.

2.23 Yarn Path of Circular Knitting m/c:



2.23 GSM depends on:

- Type of yarn
- Yarn Count
- Stitch length
- Fabric Structure.
- Finishing process.
- Depth of shade.
- Stitch density.
- Machine gauge.

2.24 Machine Specification:

Machine gauge: Selection of machine gauge depends upon yarn diameter. Yarn diameter depends upon the following:

1. Yarn count
2. Fibre type
3. Yarn twist
4. Yarn finished

2.25 General practice of yarn count and machine gauge:

Yarn count used	Machine gauge
16	**18**
18	**20**
20	**20,24**
24	**22,24**
26	**20,22,24,28**
28	**22,24,28**
30	**22,24,28,34**

2.26 Relation between cotton count & machine gauge:

For single Knitting Machine

Suitable count = G*G/18

For Double knitting machine

Suitable count= G*G/8.4

Where G is gauge of knitting machine

2.27 Knitting Equation:

WPI: Wales per inch is called WPI.

CPI: Course per inch is called CPI.

Needle calculation:

◊ Single jersey circular knitting machine needle

= ∏DG

◊ Rib/Inter lock /Double jersey circular knitting machine needle

= ∏DG×2 (two needle bed is here)

◊Single bed flat knitting m/c's needle = width× gauge

◊ V bed flat knitting m/c's needle = 2× width× gauge

Here, D = cylinder diameter ,G = Machine gauge ,Needle pitch = 1/G.

◊ **GSM:** Grams per square meter of the fabric are called GSM.

◊ **GSM =** {WPI× CPI × (39.37)2×stitch length (mm) ×Tex /1000× 1000} g/m2

◊ **Stitch density** = (WPI × CPI) inch-2

= (WPC ×CPC) cm-2

◊ **No of sinker = No of needle**

◊ **No Wales =No of needle**

◊ **No of course = No of feeders**

=No of yarn (per revolution of cylinder)

◊ **Course per minutes = No of feeders ×cylinder rpm**

◊ **Course length = yarn required for each course.**

= No of needle × stitch length

◊ **Fabric width = wale spacing ×Total no of Wales**

= (1/WPI ×No of Needles) inch

= (No of Needles/WPI× 39.37) meter

- For single jersey fabric = (∏DG/WPI×39.37) meter (open width)

=(∏DG/WPI×39.37) meter/2(Folded/Tubular width)

- For double jersey fabric = (2 × ∏DG/WPI×39.37) meter (open width)

= (2×∏DG/WPI×39.37) meter/2(Folded/Tubular width).

◊ **Fabric Length =**Course spacing ×Total course pr hour

= {(Feeder× cylinder rpm× 60)/CPI} inch/hour

= {(Feeder× cylinder rpm× 60)/CPI ×39.37} m/hour

Production calculation:

Production per hour = $\frac{R.P.M \times N.F \times N.N \times S.L(mm) \times M.E \times 60}{10 \times 2.54 \times 36 \times 840 \times yarncount \times 2.2046} kg$

Here,

R.P.M = Machine speed (Revolution per minute)

N.F = Number of feeder

N.N = Number of needle

S.L = Stitch length

M.E = Efficiency of machine

Some conversions

1 cm = 10 mm

1 inch = 2.54 cm

1 yd = 36 inch

1 hank = 840 yd

1 kg = 2.2046 lb

Calculation for total number of needle of a machine = G × D × π

Here,

G = Machine gauge

D = Machine diameter

2.28 G.S.M calculation

GSM means grams per square meter. In knitting fabric it is the main parameter. It is controlled by loop length. If loop length increases GSM will decrease and vice versa. It is measured by GSM cutter & electric balance. It may also be calculated as below.

$$\textbf{GSM} = \frac{s \times l \times tex}{100}$$

$$\textbf{GSM} = \frac{s \times l \times 590}{Ne}$$

Where,
S = wale per cm × course per cm.
= wpc × cpc.
l = loop length in mm.

2.29 Industrial Calculation of DCKIL:

Collect sample (s/j) by G.S.M cutter and weighted from the weighting balance.

e.g.; → form balance we get 1.838g grey fabric

so, Gray G,S.M=$1.838 \times 100 g/m^2$

=**183.8gm/m**^{2}

Calculate Finish G.S.M as like procedure1

By calculation finish G.S.M =**235g/m**^{2}

2.30 From finish G.S.M calculating grey GSM, SL, count:

$\rightarrow$ Suppose a fabric involve 180 finishes G.S.M

So, gray G.S.M= $\frac{FinishG.S.M}{1.3} = \frac{180}{1.3} = 138$

So, count= $\frac{4320}{F.G.S.M} = \frac{4320}{180}$ =24/s

So, S.L = $\frac{95351.5}{count \times G.GSM} = \frac{95351.5}{24 \times 138} = 28.78$ cm=2.9 mm

Calculation of S.L where yarn count = 24

$\rightarrow$ S.L=16.66d

$=16.66\frac{1}{28\sqrt{count}} = 16.66\frac{1}{28\sqrt{24}} = .308$ cm =3.08mm

Calculation if fabric width = no. of needle $\times$ fabric specification

$=(\Pi DG \times 4d)$

D = machine diameter

G = **machine gauge**

$=((\Pi DG \times \frac{1}{28\sqrt{ccount}})$

Fabric GSM calculation in DCKIL: (Easy way)

Single Jersey = 590.5 × 16.1 / S.L / Yarn Count

Double Jersey:

Rib = 590.5 × 18.1 / S.L / Yarn Count

Interlock = 590.5 × 26.1 / S.L / Yarn Count

2.31 Cam Arrangement of some Design

Single Jersey:

▲	▲	▲	▲	▲
▲	▲	▲	▲	▲

Single Pique:

▲	T
T	▲

Double Pique:

▲	▲	T	T
T	T	▲	▲

Single Lacoste:

▲	▲	T	▲
T	▲	▲	▲

Two Thread Fleece / F. Terry:

▲	T	▲	M
▲	M	▲	M
▲	M	▲	T

Twill Fleece:

▲	▲	▲	M	▲	M
▲	M	▲	▲	▲	M
▲	M	▲	M	▲	▲

Single Jersey woffle:

T	T	▲	▲
▲	▲	▲	▲

Thermal / Miss Woffle:

D	▲	▲	▲	M	M
C	M	M	▲	▲	▲

Woffle mini:

D	▲	▲	T	T
C	▲	▲	▲	▲

Flat Back Rib:

	▲	M	M
D	▲	▲	M
C	M	T	▲

Separation Rib:

	▲	M	▲	M	▲	M	▲	M	▲	M	▲	M	▲	M	▲
D	▲	M	▲	M	▲	M	▲	M	▲	M	▲	M	▲	M	▲
C	T	▲	M	▲	M	▲	M	▲	M	▲	M	▲	M	▲	M
	M	▲	M	▲	M	▲	M	▲	M	▲	M	▲	M	▲	M

Small Mash:

	▲	M	▲	M	▲	M	▲	M	▲	M
D	▲	M	▲	M	▲	M	▲	M	▲	M
C	T	▲	T	▲	T	▲	M	▲	M	▲
	M	▲	M	▲	M	▲	T	▲	T	▲

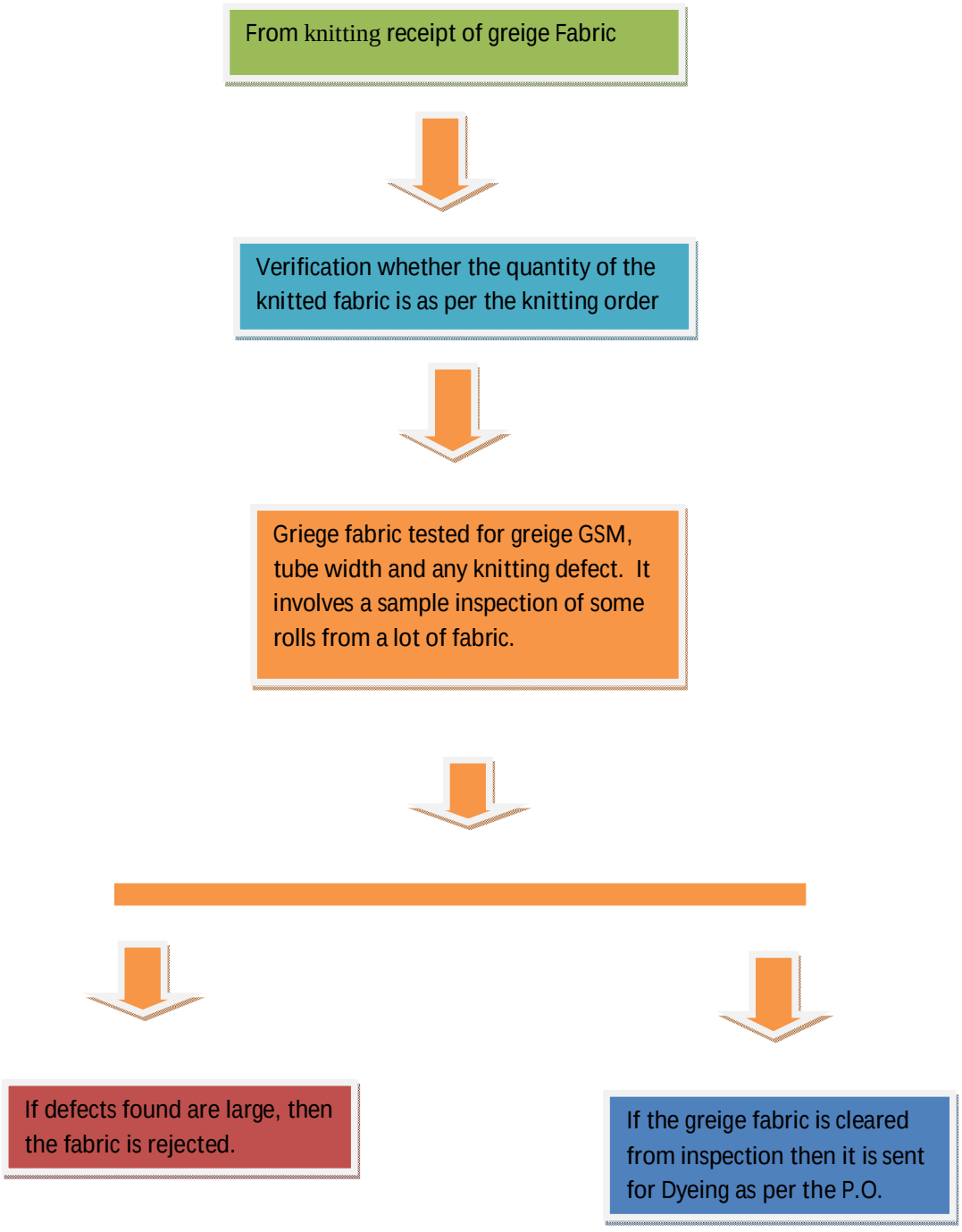
1 × 1 Rib:

	▲	▲
D	▲	▲
C	▲	▲
	▲	▲

Interlock:

	▲	M
D	M	▲
C	▲	M
	M	▲

2.33 Flow Chart of Greige Knit Fabric Inspection



2.34 Equipment used for greige inspection process

- Inspection m/c (UZU, China).
- Inspection Table.
- The m/c set up for UZU m/c is as follows:

Machine Set Up	Parameter Range	Set Value
Roller Speed	0-40m/min	25-30 m/min
Light	Not Applicable	Artificial Day light
Length Measuring Unit	Not Applicable	Attached with the m/c

2.35 Inspection Procedure

Generally a fabric roll is cut when it reaches its 'set cut length' in the circular knit m/c but the roll might cut before reaching the pre-set length if required and weight is recorded other number, quantity, GSM, Knitter, Shift, Style, Yarn lot, Roll Quantity, Machine Revs, m/c no. etc. are written on the knit card.

All rolls are kept in front of the inspection m/c time to time and are inspected over the greige inspection visually in a pre-set speed (m/min) against light. For any major/ minor faults like thick-thin place, barre mark, fall out, contamination / fly, holes, oil lines, needle lines, slubs etc. are recorded in Greige inspection report to classify the fabric based on the four point system.

In case of fly and contamination, fabric is approved for color while minor needle lines or minor stripes, fabric is approved for white. The concerned inspector records all the details of inspection result on the knit card and greige inspection report.

Collar and cuff is cut when it reaches its 'set cut no of pieces' in the flat knit m/c. and kept in front of the inspection table. These are inspected visually under the light box. Any major or minor faulty collar / cuff like having wrongly design, first round problem etc. are properly counted and recorded.

2.36 Investigation

The four point system is followed to inspect the body and rib fabric. The defects found and points given against them are recorded in the daily body and rib inspection report and daily collar and cuff inspection report.

Following tables shows the four point grading system followed by greige inspection of DCKIL:

Four Point Grading System	
Size of Defects	Penalty points
0-3''	1
Over 3''- Not over 6"	2
Over 6'' – Not over 9''	3
Above 9''	4

Rejection criteria for body & rib:

Following table shows common body & rib faults and response by grey inspection section**.**

Sl. No	Faults	Response
1.	Needle marks	Major needle line is rejected but minor needle line is approved for white.
2.	Stripe	Major needle line is rejected but minor needle line is approved for white.
3.	Barre marks	Reject
4.	Fly & contamination	Acceptable for color but not for white. 1 point is assigned against 1 contamination / fly.
5.	Slubs	1 point
6.	Thick-thin place	Reject

7.	Birds Eye	1 point
8.	Pin holes	1 point
9.	Wrong design	Reject
10.	Mixed yarn	Discuss with manager
11.	Sinker Mark	‘’
12.	Missing Yarn	Use 4 point system
13.	Holes	‘’
14.	Oil line/ Stain	‘’
15.	Chemical / Rust Stain	‘’
16.	Dirt Stain	‘’
17.	Grease Line	‘’
18.	Uneven tension	‘’

2.37 Acceptance Calculation

Defect points / 100 Sq. yards = $\frac{\textbf{Total points} \times 3600}{\textbf{Roll length (yard)} \times \textbf{Width (inch)}}$

Classification of inspection Fabric:

- **≤ 40 points = A Type**
- **41 – 60 points = B Type**
- **61 – 80 points = C Type**
- **Above 80 points = Rejects**

Acceptance: Generally any piece of fabric with 40 points or less faults per 100 sq. yard is allowed to pass however for a roll; the avg. value should not exceed 18 points per 100 sq. yard. More than 40 points fault per 100 sq. yard is recorded as reject.

Rejection: Any roll that contains wrong design, higher/ lower GSM, Barre mark, major stripe, Thick – thin, Major neps/ hairiness, uneven dye (yarn dyed), major needle line, more than 40 points / 100 sq. yard is considered as reject. As collar or cuff that contains wrong ply, hole, slubs, first round problem, needle line, wrong design, round missing. Wrong tipping is considered as reject.

2.38 Different Types of Knitting Faults that are identified by Greige Inspection

Faults	Causes	Sample
Holes or cracks	Bad needle, take down mechanism too light, high tension on yarn, bad yarn, needle too tight in their slots, dial height too high or too low, badly tied knots, improper stitch setting.	
Drop stitches or cloth fall out	Take down mechanism too loose, defective needles, wrong needle timing set and needle tricks closed.	
Vertical lines	Defective needle, dirt in needle slots, needle to loose or too tight in the slots, needles not enough lubricated.	
Barre or horizontal stripes	Bad yarn, uneven tension, yarn slippage in positive feed, improper stitch cam setting.	
Oil lines	Fibers & fluff accumulated in the needle tricks, which remain soaked with oil. Excessive oiling of the, needle beds.	

Needle Lines	Bent Latches, Needle Hooks & Needle stems Tight Needles in the grooves Wrong Needle selection (Wrong sequence of needles, put in the Cylinder or Dial)	
Sinker Lines	Bent or Worn out Sinkers Sinkers being tight in, the Sinker Ring grooves	
Contamination	Presence of dead fibers & other foreign materials, such as; dyed fibers, husk & synthetic fibers etc.	
Broken Needle	High Yarn Tension Bad Setting of the Yarn Feeders Old & Worn out Needle set	
Rust marks	Rusty needle Rust in tricks	
Mixed yarn	Different yarns are feed.	

BATCHING

3.1 BATCH PREPARATION

Primarily batching is done by batching section which is supervised by dyeing manager. The main function of batching section is to prepare the batch for dyeing according to machine capacity, order and emergency. This section receive the grey fabric from knitting section and make batch according to order for particular shade. Then this batch delivers to dyeing section for dyeing.

3.2 Type of Batch

Batching are Two types,

a. **Solid Batch**
b. **Ratio Batch**

3.3 Function or purpose of Batch Section

- To receive the grey fabric roll form knitting or other source.
- Turn the gray fabric if require.
- Prepare the batch for dyeing according to the following criteria:
    - Order sheet (Received from buyer)
    - Dyeing shade (light or dark, color or white)
    - Machine capacity.
    - Type of fabric (100% Cotton, CVC, Stripe fabric)
    - Emergency order.
    - Fabric construction (Single jersey, Rib, Lycra Rib, Lacoste, PK etc.)
- To send the grey fabric to the dyeing floor with batch card.
- To keep record.

3.4 Proper Batching Criteria

- To use maximum capacity of existing dyeing machine.
- To minimize preparation time & machine stoppage time.
- To use a particular machine for dyeing same shade.
- To keep the no of batch as less as possible for same shade.

3.5 Batch management

Primarily batching is done by dyeing manager taking the above criteria under consideration. Batch section in charge receives this primary batch plan from dyeing manager. Some time planning is adjusted according to m/c condition or emergency.

3.6 Batch Preparation

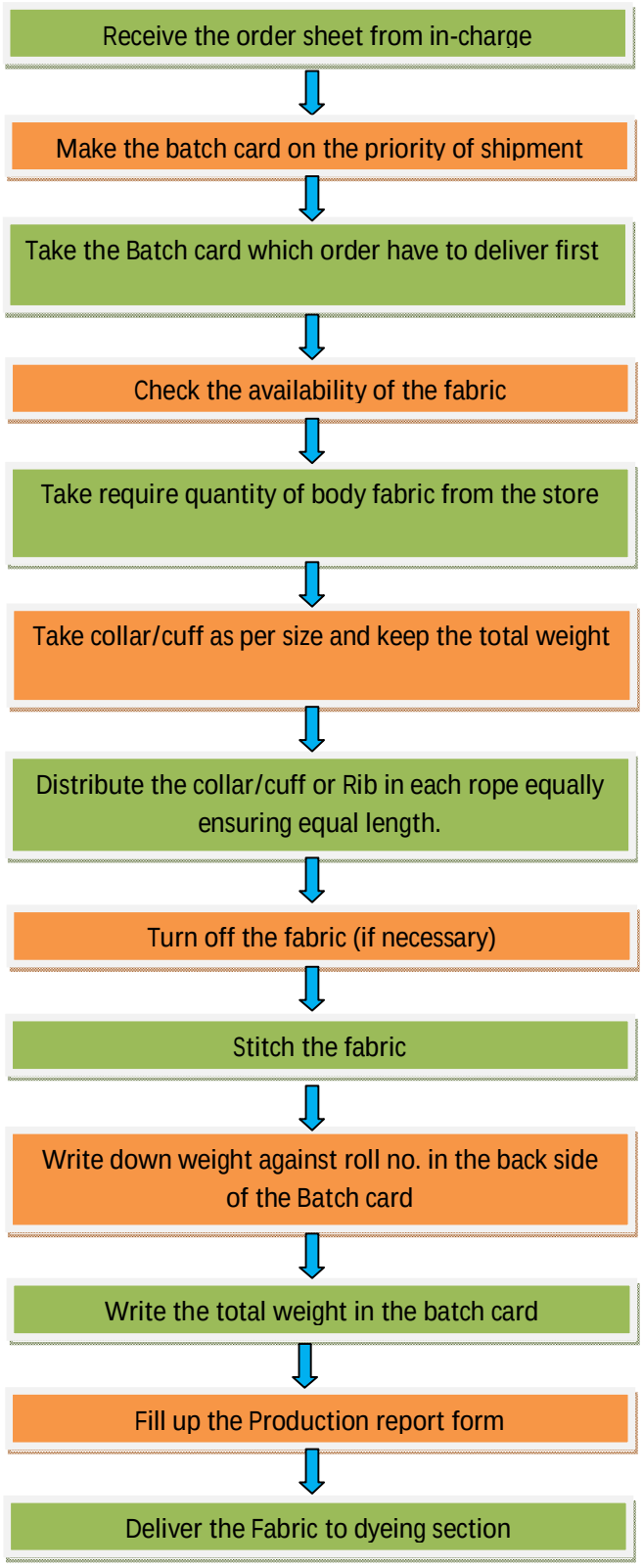
Normally the Batch is prepared according to following criteria:

- Order sheet
- Dyeing Shade
- Machine Capacity
- Machine available
- Type of fabric

3.7 Information Check Point

- Order No
- Color
- Yarn Count
- Yarn Lot
- Yarb Brand
- Machine No.
- Roll No.
- Buyer Name
- Grey GSM
- Finished GSM

3.8 Process flow chart of Batch preparation



DYEING

6.1 DYEING SECTION LAYOUT

6.2 ORGAN GRAM OF DYEING

Above managerial system is must for better management. But it is very rear because all of the industries are not same in volume and not interested to main all of the class of the managerial system. For this reason, some part of the managerial system could be absent. So, if anyone wants to get better production he or she should have to maintain the above managerial system.

6.3 Process Flow Chart of Dyeing:

Grey Textile Materials (Fiber, Yarn or fabric)

↓

Singeing

↓

Desizing

↓

Scouring

↓

Bleaching

↓

Mercerizing

↓

Dyeing/Printing

↓

Finishing

↓

Marketing

Now I like to discuss shortly about the different terms of the flow chat. Here, grey textile materials are fiber, yarn or fabric which is also consider as the raw materials for dyeing.

Singeing is the first steps of pre-treatment. The process by which loose, hairy and projecting fibers are removed is called Singeing.
Desizing is the second steps of pre-treatment. By this process gummy materials are removed. Also size materials removed by this process.
Scouring is the third steps of pre-treatment. This process is performed for removing impurities of the textile materials.
Bleaching is another important step which is used to reduce natural color of the raw materials. Dyeing performance depends on it much more.
Mercerizing is the special types of treatment. It performs if buyer wants. It is an additional treatment. It increases the strength and luster of the materials.
Dyeing is the main process where a white material becomes decorated by different colors. We have to know about the depth of shade of the materials.
Printing is called as localized dyeing. Different types of printing are done for giving special appearance on colored or white fabric.
Finishing is the last treatment of wet processing. Different types of properties can be added to the materials by different finishing effects.
Marketing is our main goal. Say, if we done everything but there have no buyer then everything is waste. So we should have a strong marketing department.
So, all of this is about flow chart of Dyeing.

6.4 ESSENCIAL CONSIDERATIONS BEFORE DYEING:

1	**Reference Shade**	Approved Lap Dip	Merchandiser should provide a approved sample to dyeing dept.
2	**Light Source**	**D65, TL83, CWF, UV**	**Single Light Or Multiple Light ?**
3	**Colour Matching**	**Visual Or Instrumental**	
4	**Colour Type (Contrast /Solid)**	**Main fabric or contrash piping**	
5	**Approval Procedure**	**Each batch need to taken an approval**	
6	**Test Requirement**	**Rubbing, wash, Light, Perspiration**	
7	**Surface Quality Assessment (Hand feel)**	**Need Sample or Made Sample and to get approval to assess clean sample,colour,shade**	

6.5 PROCESS CONTROL PARAMETERS

Buyer	:_____	Date	:_____
Style No	:_____	Unit	:_____
Order No	:_____	Load Time	:_____
Lot No.	:_____	Unload Time	:_____
Machine No.	:_____	Dyeing Program No	:_____
Batch No.	:_____	Colour	:_____
Fabric Type	:_____	Yarn Count	:_____

Sl.#	CONTROL POINTS	STANDARD PARAMETER	METHOD
	Seam Detection (to cut the		
1	Sample during Dyeing)	MUST	Joining Polyester Fabric in
			left or right most nozzle
		Rope length should be same	
2	Rope Length	for all nozzle same Length	Rope length formula
	(Before Loading)		$\frac{\text{\_\_\_\_\_}}{19690}$
			Gray Dia x Gray GSM
3	Cycle time (by watch)	Not Above 2.5	Stopwatch
4	Reel Speed	200 -300 m/min	See from the controll panel
5	Pump Pressure	0.6 for S/J, Rib	Through Controll panel
		0.7 for Fleece	
6	Nozzle Position	As per Table (Delmilner m/c)	Through Controll panel
		110-160 -50%	
		160-200 -75%	
		200+ -100%	
7	Nozzle Size	Thies- 80 for small dia	Through Controll panel

		Thies- 120 for bigger	
		& higher GSM	
8	Scouring Liquor Ratio	1: 8 - 1:6	Flow Meter
9	Scouring Whiteness	As compare to Lab Sample	Spectophoto Meter
	(For Light Colours)		
	Whiteness Index	75-80	
10	Absorbency	Excellent	By Drop test
		Less than 3 sec.	Wicking Test
11	Seed Cotton	Nill	Visual Test
12	Residual Peroxide		
	(Peroxide Killing)	0	Peroxide Strip
13	Gluber Salt pH	6.7 - 7.0	
	(Before Addition)	If More Adjust by acide	Digital pH meter
14	Enzyme Bath : pH	4.5	Digital pH meter
	Temperature	50 C' - 55 C'	Temperature indicator
	Time	50 Minutes	Machine
15	Fabric pH	Neutral	Univesal Indicator Solution
16	Dye Bath pH	5.5 - 6.5 (Based on Glauber	Digital pH meter
		Salt pH)	
17	Liqure Ratio for Dyeing	Dark Colours 1:6	Flow meter
		Light Colour 1:8	

		Terkish Colour 1.10	
18	Liqure Ratio Adjustment	Standard Table of	By checking gluber Salt
		Specific Gravity	Specific gravity through
			Tables
19	Fixation pH:	Light Colours -10.3-10.5	
		Dark Colours 10.8-11.0	Digital pH meter
	(10 min. of afetr adding	Black Colour 11.2-11.4	
	Alkali)	s	
20	Sample Check After 20 Mints.	Should be in initial depth	Visual Test
		Of the shade.	
21	Bath Drop Time &	After matching with swatch	Power drum
	Temperature		
22	Before Soaping TDS & pH	TDS should be 150	TDS meter
		pH 6.5	Digital pH meter
23	Soaping pH	6.5 - 7.0	Digital pH meter
24	Fixing Bath pH	Dark Colour 6.0	Digital pH meter
25	Softener pH	6.0 - 6.5	Digital pH meter
	Temperature	40 C'	Temperature indicator
	Time	20 -30 Min.	

6.7 Loading Capacity of Dyeing Machines

M/C No	Brand	Capacity	Flauroscnt	Loading Capacity on the basis of GSM Range				
				110-120	130-150	160	180	200+
			65%	75%	82%	88%	93%	96%
1	Thies	720	468	540	590	634	670	691
2	Thies	720	468	540	590	634	670	691
3	Thies	540	351	405	443	475	502	518
4	Thies	350	228	263	287	308	326	336
5	Dilmenler	700	455	525	574	616	651	672
6	Dilmenler	1050	683	788	861	924	977	1008
7	Dilmenler	700	455	525	574	616	651	672
8	ATYC	800	520	600	656	704	744	768
9	Dilmenler	150	98	113	123	132	140	144
11	Dilmenler	1050	683	788	861	924	977	1008
12	Dilmenler	1050	683	788	861	924	977	1008
13	Dilmenler	1500	975	1125	1230	1320	1395	1440
14	Dilmenler	1500	975	1125	1230	1320	1395	1440
15	Dilmenler	1050	683	788	861	924	977	1008
16	Dilmenler	1050	683	788	861	924	977	1008
17	Dilmenler	350	228	263	287	308	326	336
18	Dilmenler	350	228	263	287	308	326	336
19	Dilmenler	150	98	113	123	132	140	144
20	Dilmenler	150	98	113	123	132	140	144
		13930	9055	10448	11423	12258	12955	13373
Note: For Turqouise combination & Royal colour loading should not be more than 80% of m/c								AVG X 2 =24182

6.8 Bulk Dyeing Machine Specification:

Machine No.	Brand	Capacity (kg)	Origin	Unit	Qty.	Total Capacity	Type
1,2	Thies	720	Germany	1	2	1440	HTHP
3	Thies	540	Germany	1	1	540	HTHP
4	Thies	350	Germany	1	1	350	HTHP
5,7	Dilmenler	700	Turkey	1	2	1400	HTHP
6	Dilmenler	1050	Turkey	1	1	1050	HTHP
8	ATYC	800	Spain	1	1	800	HTHP
9	Dilmenler	150	Turkey	1	1	150	HTHP
11,12,15,16	Dilmenler	1050	Turkey	2	4	4200	HTHP
13,14	Dilmenler	1500	Turkey	2	2	3000	HTHP
17,18	Dilmenler	350	Turkey	2	2	700	HTHP
19,20	Dilmenler	150	Turkey	2	2	300	HTHP
				Total	19	13930	

Machine Type 01

Name of the machine : Winch Dyeing Machine (HTHP Jumbo Jet Flow)

Brand Name : Thies

No. of machines : 4

Manufacturer : Germany.

Capacity : 350, 540, 720, 720 Kg

Year of manufacturing: 2000

Specification :

Maximum operating temp – 135^0C

Maximum operating pressure – 3.5 bar

Machine Type 02

Name of the machine : Winch Dyeing Machine (HTHP Jumbo Jet Flow)

No. of machine : 10

Brand Name : DILMENLER

Manufacturer : Turkey

Capacity : 150 (3), 350 (2), 700 (2), 1050, 1500 (2) Kg

Year of manufacturing: 2003

Specification :

Maximum operating temp – 135^0C

Maximum operating pressure – 3 bar

No of nozzle – 4

Motor

Winch motor – 4

Pump motor – 1

Stirring motor – 1

Machine Type 03

Name of the machine : Winch Dyeing Machine (HTHP Jumbo fuel Automatic)

No. of machine : 04

Brand Name : DILMENLER

Manufacturer : Turkey

Capacity : 1050 (2) Kg

Year of manufacturing: 2003

Specification :

Maximum operating temp – 135^0C

Maximum operating pressure – 3 bar

No of nozzle – 4

Motor

Winch motor – 4

Pump motor – 1

Stirring motor – 1

Machine Type 04

Name of the machine: ATYC Dyeing Machine

No. of machine : 01

Brand Name : ATYC

Manufacturer : TERRASSA

Capacity : 900 Kg

Year of manufacturing: 2002

Specification :

Maximum operating temp – 135^0C

Maximum operating pressure – 3.5 bar (6 bar max.)

6.9 Sample Dyeing Machine Specification:

Machine Type 01

Name of the machine : Winch Dyeing Machine

Machine Type : Sample Dyeing

No. of machine : 02

Brand Name : DILMENLER

Manufacturer : Turkey

Capacity : 50 (2) Kg

Year of manufacturing: 2003

Machine Type 02

Name of the machine : Jet Dyeing Machine

Machine Type : Sample Dyeing

No. of machine : 02

Brand Name : FONGS

Manufacturer : SHENZHEN

Capacity : 50 (2) Kg

Year of manufacturing: 1997

Machine Type 03

Name of the machine : Winch Dyeing Machine

Machine Type : Sample Dyeing

No. of machine : 02

Brand Name : SETEX

Capacity : 50 (2) Kg

Machine Type 04

Name of the machine : Bangla Dyeing Machine

Machine Type : Sample Dyeing

No. of machine : 09

Capacity : 10 (3), 15 (3), 30 (3) Kg

6.10 Lab Dyeing Machine Specification:

Machine Type 01

Name of the machine : Rapid Lab Dyeing Machine

Machine Type : Lab Dyeing

No. of machine : 04

No of Cane : 24 (Glycerine bath), 10 (water bath).

Machine Type 02

Name of the machine : Smart Dyeing Machine

Machine Type : Lab Dyeing

No. of machine : 02

No of Cane : 16, 18

6.11 Operation Process:

Preparation:

1. Turn on power on main panel
2. Open valve for cooling water of main pump
3. Check stream, water & air
   + Steam pressure : 5 – 6 kg/cm2 G
   + Water pressure : 1.2 – 2 kg/cm2 G
   + Air pressure : 5 – 7 kg/cm2 G
4. Adjustment of feeding valve as per production item & capacity

Putting fabric into the machine:

1. Select water supply level
2. Supply water automatically by pushing 'turn on' button and stop by 'turn off' button.
3. Take up edge of fabric to fabric gate through guide of the reel
4. Put edge of fabric to nozzle
5. Start main pump and put whole fabric with adjusting feeding by valve upto remaining 2 -3 meters fabric end
6. Stop main pump and pull up 2 -3 meters of fabric edge by stick
7. Joint both ends of fabric
8. Start main pump & reel to circulate whole fabric and adjust torque of speed
9. Make sure if fabric circulation is normal, then close the door of the gate, (Check again reel speed)

Operation:

1. Close the door
2. In-put the pattern on programme controller
3. Mix dyeing stuff & chemical in dyeing-mixing tank and pour it with using pouring pump by adjusting feeding valve, after poring, feeding valve shall be closed
4. Switch 'run' on programme setting device
5. Automatic operation
   1) Select the switch of water supply to 'automatic' on main panel
   2) Push the button of automatic operation, then automatically operation will go through heating, holding, cooling, washing as per programming. Put 'stop' button when finishing buzzer will ring
   3) Open the door and take out fabric

Caution:

1. **Before operation:**
   (1) Check the power (Voltage/hz) wrong Voltage / Hz will cause to brake motor, meter etc
   (2) Check air pressure
   (3) Clean inside of tube before dyeing
   (4) Set the meter correctly as per dyeing method
   (5) Check every valves

2. **Starting operation:**
   (1) Check closing the door perfectly
   (2) Set pressure below 1 kg / cm^3 by watching pressure meter
   (3) When temperature will be over more than 80^0C, do not forget item (1) & (2)
   (4) Do not start pump when tube is empty
   (5) Put definitely cooling water before starting operation because pump & reel is made for cool water

3. **During operation**
   (1) Check if meter is working correctly during operation
   (2) Check if any strange vibration
   (3) Check if any strange sound of pumping
   (4) Check if pressure in the tube is too high
   (5) Check if temperature in the tube meet programming
   (6) Start pump when feeding steam & cooling water
   (7) Check if reel is working correct under high temperature & high pressure

4. **Nozzle installation**

Set nozzle base into nozzle-casing and install nozzle by turning it clock wise.

After install nozzle, turn it one round by anti-clock wise to make 2 mm gap. The gap on nozzle shall be adjusted by kind of fabric

5. **After operation**
   (1) Before opening the door, check if air pressure of inside the tube is 0 kg/cm2 and temperature of inside the tube is between 80^0-90^0C if the pressure is still

remained or temperature is more than 80^0C, it is very dangerous to open the door

(2) Temperature inside the tube shall be under 80^0C for manual draining

(3) Turn off the power after operation and close the valve

6. Maintenance:

- Keep cleaning seal packing of the door and surface to touch the packing to be prevented from dust and hurting
- Keep electric portion, pump and control panel not to be wet by water
- Keep tight valve shaft seal ground packing of each valve by tightening sometime
- Check valve seat part of air valve & drain valve sometime
- Keep tight each volt
- Make often oiling rotating part
- Inspect mechanical seal according to manual of pump
- Keep adding grease & oil in pump bearing part according to manual of pump
- Inspect sometime if safety valve is working correctly
- Inspect sometime if steam trap is working correctly
- Inspect meters of pressure and temperature

6.12 Production Parameters:

a. pH:

- During H_2O_2 bleaching pH 9 – 11
- During reactive dyeing pH 10.5 – 12
- During disperse dyeing pH 4.5 – 5.5

b. Temperature:

- For cotton scouring 90^0-95^0C
- For cotton cold wash 30^0 – 40^0C
- For cotton hot wash 70^0-80^0C
- For cotton acid wash 60^0-70^0C
- For cotton dyeing 80^0-90^0C (For hot brand)
  40-60^0C (For cold brand)
- Polyester dyeing: 100^0-130^0C

c. Time:

- For scouring 60-90 mins
- For reactive dyeing 60-90 mins
- For disperse dyeing 60-90 mins

d. M:L ratio:

- For reactive dyeing M:L ration maintained between 1 : 8 to 1 : 10

6.13 Dyeing Recipe:

Fabric Composition: 100% Cotton		
Fabric Type: Single Jersey		
Colour Name : Black		
Scouring & Bleaching:		
Product Type	**Product Name**	**Dosage**
Anti-foam	**Albaflow JET**	**0.1 g/l**
Anti-crease	**Albafluid C**	**0.5 g/l**
Peroxide Stabilizer	**Gemstap HP-52**	**0.5 g/l**
Detergent	**Imerol DLJ**	**0.5 g/l**
Scouring agent	**Caustic Soda**	**2.0 g/l**
Bleaching agent	**Hydrogen Peroxide**	**2.5 g/l**
Peroxide Killing:		
H_2O_2 Killer	**Bactosol SAP**	**0.5 g/l**
Neutralisation:		
Neutraliser	**Platilon 2900(Acid Buffer)**	**1.0 g/l**
Enzyme Treatment:		
pH adjustor	**Platilon 2900**	**0.4 g/l**
Anti-pilling Enzyme	**Bactosol CA**	**1.0 g/l**

Dyeing:		
Reactive Dye	**Novacron Yellow FN2R**	**0.25%**
Reactive Dye	**Novacron Red FNR**	**0.30%**
Reactive Dye	**Novacron Black WNN**	**7.50%**
Dye bath sequestrant	**Ladiquest 1097-U**	**0.75 g/l**
Levelling Agent	**Drimagen E2R**	**0.50 g/l**
Anti-crease	**Albafluid C**	**0.50 g/l**
Electrolite	**Glauber's Salt**	**80 g/l**
Alkali	**Soda Ash**	**20 g/l**
Neutraliser	**Platilon 2900 (Acid Buffer)**	**0.5 g/l**
Wash off agent	**Sandopur SP**	**2 g/l**
Cationic softener	**Sapamine CWS**	**1%**
Fabric Composition: 100% Cotton		
Colour Name : Red		
Scouring & Bleaching:		
Product Type	**Product Name**	**Dosage**
Anti-foam	**Albaflow JET**	**0.1 g/l**
Anti-crease	**Albafluid C**	**0.5 g/l**
Peroxide Stabilizer	**Gemstap HP-52**	**0.5 g/l**
Detergent	**Imerol DLJ**	**0.5 g/l**
Scouring agent	**Caustic Soda**	**2.0 g/l**
Bleaching agent	**Hydrogen Peroxide**	**2.5 g/l**
Peroxide Killing:		
H_2O_2 Killer	**Bactosol SAP**	**0.5 g/l**
Neutralisation:		
Neutraliser	**Platilon 2900(Acid Buffer)**	**1.0 g/l**
Enzyme Treatment:		
pH adjustor	**Platilon 2900**	**0.4 g/l**
Anti-pilling Enzyme	**Bactosol CA**	**1.0 g/l**

Dyeing:		
Reactive Dye	**Novacron Yellow FN2R**	**0.50%**
Reactive Dye	**Novacron Red FNR**	**2.50%**
Reactive Dye	**Novacron Black WNN**	**0.05%**
Dye bath sequestrant	**Ladiquest 1097-U**	**0.75 g/l**
Levelling Agent	**Drimagen E2R**	**0.50 g/l**
Anti-crease	**Albafluid C**	**0.50 g/l**
Electrolite	**Glauber's Salt**	**60 g/l**
Alkali	**Soda Ash**	**15 g/l**
Neutraliser	**Platilon 2900 (Acid Buffer)**	**0.5 g/l**
Wash off agent	**Sandopur SP**	**1 g/l**
Cationic softener	**Sapamine CWS**	**1%**

6.14 Dyeing Flow Chart

Production flow chart for 100% cotton:

Grey fabric loading

↓

Scouring & bleaching at 95^{o}C for 1 hour

↓

H_2O_2 killer [invotex PC]

↓

Ascetic Acid

↓

Enzyme [pH 4 – 4.5, temp 60^{o}C for 40'-60']

↓

Hot wash

↓

Leveling [Ladiquest 1097]

↓

Dyeing

Salt

Color

Soda

↓

Acid

↓

Hot wash [Decol SN, RSK, RFL]

↓

Fixing [VNF, ECO]

↓

Softener [LCF, Non ionic]

↓

Unload

Dyeing flow chart of polyester cotton:

Dyeing sequence of polyester cotton is the combination of polyester and cotton dyeing process. For this reason this dyeing process is called double part dyeing process. In this dyeing process; polyester part is dyed first than cotton part is dyed.

Carrier and vessel washed by hydrose and caustic at 1000 C for 20 min

↓

Load the package in the carrier and feed in the vessel

↓

Add wetting agent, antifoaming agent, sequestering agent and run at 600 C for 10 min

↓

Water solution drain

↓

Add wetting agent, sequestering agent, caustic soda and hydrogen peroxide and run at 1100 C for
single yarn and 1150 C for double yarn for 20 min

↓

Drain

↓

Add peroxide killer and run at 900 C for 10 min

↓

Peroxide check in the package

↓

Drain

↓

Add acetic acid for neutralization and run for 20 min at 500 C

↓

Drain

↓

Take sample and check absorbency

↓

Ok

↓

Dyeing period (Polyester part)

↓

Add leveling agent and acid, run at 600 C for 10 min

↓

PH check

↓

Color mixing at 700 C for 40 min

↓

Color dosing at 600 C for 20 min

↓

Sample check

↓

Ok

↓

Temperature cool down at 780 C and drain

↓

Hot wash for 10 min

↓

Rinse for 15 min for light shade and 25 min for dark shade

↓

Add hydrose, soda ash, run at 800 C for 20 min

↓

Drain

↓

Neutralization by acetic acid at 500 C 20 min

↓

Take sample

↓

Carbonizing by acid for 10-20 min

↓

Neutralization by acetic acid at 500 C for 20 min

↓

Drain

↓

Dyeing of polyester part complete

↓

Dyeing period (Cotton part)

↓

Add wetting agent, antifoaming agent, sequestering agent and run at 600 C for 10 min

↓

Color dosing at 600 C for 20 min

↓

Color migration at 600 C for 30 min

↓

Salt dosing at 600 C for 20 min

↓

Run the machine for 20 min at 600 C with color and salt

↓

Soda dosing at 600 C for 40 min

↓

Cotton dyeing at 600 C for 50 min

↓

Check sample

↓

Ok

↓

Drain

↓

Rinse for 10 min

↓

Add acetic acid for neutralization and run for 10 min at 500 C

↓

Drain

↓

Add washing chemical and run at 900 C for 20 min

↓

Wash sample check

↓

Ok

↓

Drain

↓

Rinse for 10 min

↓

Add fixing chemical and half acetic acid, run at 500 C for 20 min

↓

Add softening agent and rest half acid, run at 600 C for 20 min

↓

Check finished sample

↓

Ok

↓

Drain

It is note that; dyeing sequence of CVC is as same as P/C dyeing. If we want to dye CVC then we can run the process as same the above process sequence.

<u>Dyeing flow chart of cotton with Turquoise Color:</u> (Light Shade)

Turquoise color dyeing is critical than the normal color dyeing. This type of dyes is used for produce specific color.

Carrier and vessel washed by hydrose and caustic at 1000 C for 20 min

↓

Load the package in the carrier and feed in the vessel

↓

Add wetting agent, anti foaming agent, sequestering agent and run at 600 C for 10 min

↓

Water solution drain

↓

Add wetting agent, sequestering agent, caustic soda and hydrogen peroxide and run at 1100 C for single yarn and 1150 C for double yarn for 20 min

↓

Drain

↓

Add peroxide killer and run at 900 C for 10 min

↓

Peroxide check in the package

↓

Drain

↓

Add acetic acid for neutralization and run for 20 min at 500 C

↓

Drain

↓

Absorbency test of sample

↓

Ok

↓

Dyeing period

↓

Add wetting agent, antifoaming agent, sequestering agent and run at 600 C for 10 min

↓

Color dosing at 600 C for 20 min

↓

Color migration at 800 – 900 C for 30 min

↓

Salt dosing at 600 C for 20 min

↓

Run the machine for 20 min at 800 – 900 C with color and salt

↓

Soda dosing at 600 C for 40 min

↓

Cotton dyeing at 800 – 900 C for 50 min

↓

Check sample

↓

Ok

↓

Drain

↓

Rinse for 10 min

↓

Add acetic acid for neutralization and run for 10 min at 500 C

↓

Drain

↓

Add washing chemical and run at 900 C for 20 min

↓

Wash sample check

↓

Ok

↓

Drain

↓

Rinse for 10 min

↓

Add fixing chemical and half acetic acid, run at 500 C for 20 min

↓

Add softening agent and rest half acid, run at 600 C for 20 min

↓

Check finished sample

↓

Ok

↓

Drain

<u>Dyeing flow chart of cotton with Turquoise Color:</u> (Dark Shade)

Shade of the textile materials depends on the dyes percentage which is used for dyeing. Chemical which is used for dyeing also vary depending on the dyes used. Generally dark shade means the dyes percentage above 2%. Medium shade dyeing and dark shade dyeing process is nearly same.

Carrier and vessel washed by hydrose and caustic at 1000 C for 20 min

↓

Load the package in the carrier and feed in the vessel

↓

Add wetting agent, antifoaming agent, sequestering agent and run at 600 C for 10 min

↓

Water solution drain

↓

Add wetting agent, sequestering agent, caustic soda and hydrogen peroxide and run at 1100 C for
single yarn and 1150 C for double yarn for 20 min

↓

Drain

↓

Add peroxide killer and run at 900 C for 10 min

↓

Peroxide check in the package

↓

Drain

↓

Add acetic acid for neutralization and run for 20 min at 500 C

↓

Drain

↓

Absorbency test of sample

↓

Ok

↓

Dyeing period

↓

Add salt, wetting agent, antifoaming agent, sequestering agent and run at 600 C for 10 min

↓

PH check

↓

Color dosing at 600 C for 30 min

↓

Color migration at 800 – 900 C for 30 min

↓

Migration package check

↓

Ok

↓

Run the machine for 20 min at 800 – 900 C with color and salt

↓

Soda dosing at 600 C for 40 min

↓

Cotton dyeing at 800 – 900 C for 50 min

↓

Check sample

↓

Ok

↓

Drain

↓

Rinse for 10 min

↓

Add acetic acid for neutralization and run for 10 min at 500 C

↓

Drain

↓

Add washing chemical and run at 950 C for 20 min

↓

Add washing chemical and run at 900 C for 20 min

↓

Ok

↓

Drain

↓

Rinse for 10 min

↓

Add fixing chemical and half acetic acid, run at 500 C for 20 min

↓

Add softening agent and rest half acid, run at 600 C for 20 min

↓

Check finished sample

↓

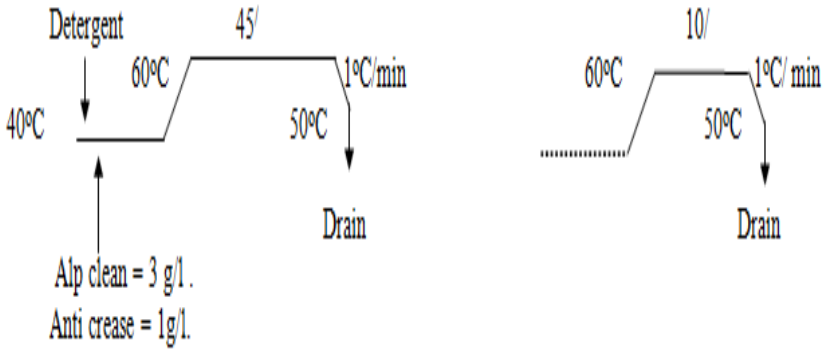
Ok

↓

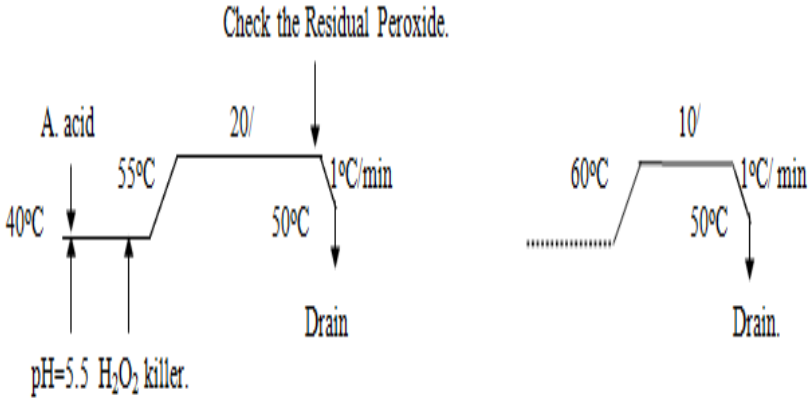
Drain

Dyeing Process for Viscose / Spandex Viscose Fabric:

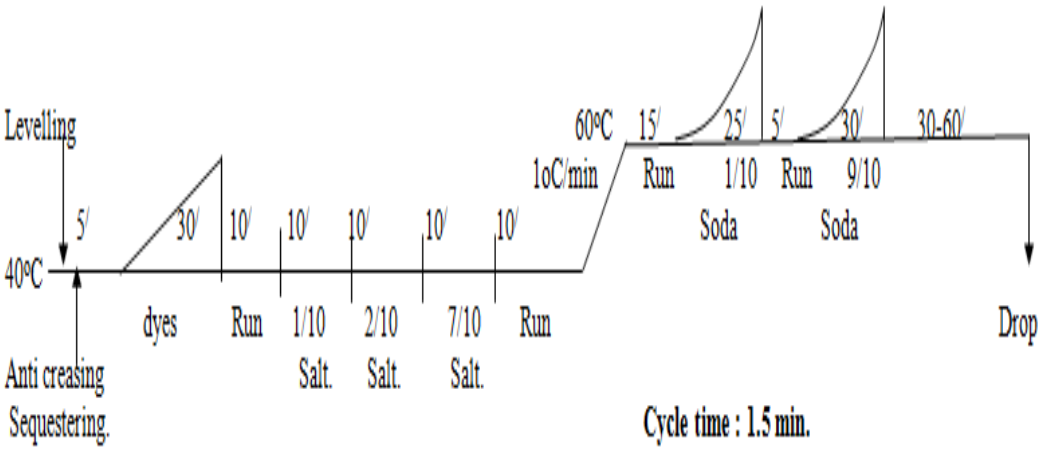
Pretreatment curve:



PerOxide (H_2O_2) Cleaning :



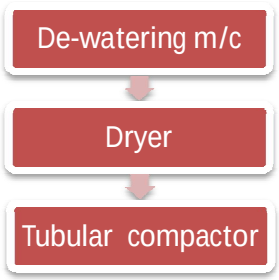
Dyeing Curve:



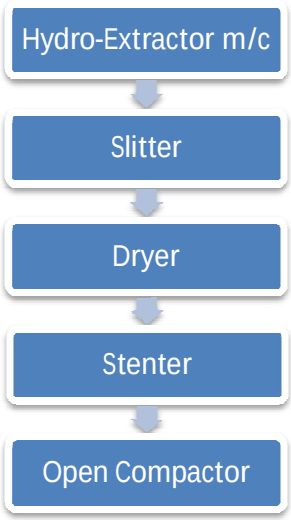
FINISHING

7.2 Process sequence of Finishing Machineries

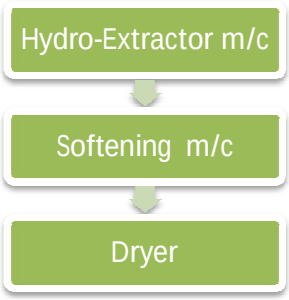
For Tubular form of Fabric:



For Open form of Fabric:



For Collar and Cuff:



Finishing is the final steps of wet processing technology. A textile products either it is dyed or printed it needs to add some finishing features before marketing. By applying different finishing techniques a product becomes more comfortable to use. So finishing should be easier to apply

7.3 Objects of Finishing:

1. To improve the attractiveness of the fabric.
2. To increase the life time or durability of the fabric.
3. To meet up specific requirement of the fabric for achieve the final goal.

Finishing plays an important role in the modern age. Everyone likes to wear finished products with some special types of finishing. Finishing of the fabric depends on the requirement of the buyer. Different types of finishing machine are use in finishing operation.

7.4 Classification of Finishes:

Textile finishes are classified in different ways. The most common classification are-

Aesthetics finishes: This type of finishes make change or modify the appearance of the fabric or hand/ drape properties of the fabrics.

Functional finishes: This type of finishes changes the internal performance properties of the fabric.

Permanent finishes: It involves a chemical change in fibre structure and do not change throughout the life of a fabric.

Durable finishes: Usually last throughout the life of a fabric, effectiveness becomes diminished after each cleaning and near the end of normal use of the fabrics, the finishing is nearly removed.

Semi-durable finishes: Usually last several launderings or dry cleanings and many are removal in home laundering or dry cleaning.

Temporary finishes: Removed or substantially diminished the first time an article is laundered or dry cleaning.

7.5 Finishing Machine Profile (DCKIL)

De-Watering Machine:

Brand	Type	Origin	Unit	Qty.	Capacity/Day
Calator	Tube	Sweden	1	**1**	**6000**
Fabcon	Tube	USA	1	**1**	**6000**
Bianco	Tube	Italy	2	**1**	**7000**
Bianco	Open	Italy	2	**1**	**14000**
Taida	Open	Turkey	1	**1**	**10000**
Dilmenler	Open	Turkey	3	**1**	**10000**
	Total Capacity			**6**	**53000**

Relax Dryer:

Ruckh	Gas heated	Tube	Germany	1	**1**	**7000**
Santex	Gas heated	Tube	Switzerland	1	**1**	**6000**
	Total Capacity				**2**	**13000**

Stenter:

Bruckner	**6 Chamber**	Open	Germany	2	**1**	**12000**
Taida	**6 Chamber**	Open	China	3	**1**	**10000**
TTM	**8 Chamber**	Open	Turkey	3	**1**	**15000**
	Total Capacity				**3**	**37000**

Compactor:

Fab-Con		Tube	USA	1	**1**	**7000**
Ferraro		Tube	Italy	1	**1**	**6000**
Lafer S.p.a	1,2	Open	Italy	2	**2**	**12000**
HAS fco		Open	Turkey	3	**1**	**10000**
	Total Capacity				**5**	**35000**

BRUSH & PEACH:

HAS csm	Peach	Open	Turkey	3	**1**	**5000**
I Kuang	Brush	Open+Tube	China	3	**1**	**5000**
Gma Tex	Brush	Open+Tube	Germany	3	**1**	**4000**
	Total Capacity				**3**	**14000**

BACK SEWING:

MTG		Italy	2	**1**	5000
TMS		Turkey	3	**1**	5000
	Total Capacity			**2**	**10000**

7.6 DESCRIPTION OF DIFFERENT FINISHING MACHINE

Hydro Extractor m/c

Manufacturer : Nazar Corporation (Pakistan)
Extraction% : 65% Maximum
Speed : 1400 rpm
Extraction time : 5-7 min
Function : To remove the water from the fabric by centrifugal extraction.

Dewatering Machine

Manufacturer: CALATOR (SWEDEN)
Function:

1. Reduce water content
2. Apply finishing chemical
3. Open the fabric from rope form

Controlling Parameters:
Padder pressure : 4-7 bar
Pick up % : 80-85%
Speed at m/c : 8-60 m/min

Chemical application:
Softener: To soften the fabric
Acetic acid : 0.25 g/l
pH : 7.5

Ruckh Relax Dryer (Germany)

- Gas burner Heated
- 4 Chamber, 1 burner/ 2 chamber.

Santex Relax Dryer (Switzerland)

- Steam Heated
- 2 Chamber
- Machine set up for **Ruckh** relax dryer is as follows:

Machine Parameters	Set-up Value
Temp. Setting	(100-120)°c for White Shade (120-130)°c for Light Shade (130-140)°c for Dark Shade (140-170)°c for Curing
Blower Fan setting	Auto
Exhaust Fan setting	Auto
Machine Speed	3-35 m/min (depends on quality of fabric)
Over feed	0-40 % (depends on the fabric construction)
Width of Expender Setting	45- 114 cm (depends on the required fabric width)
Burner Gas pressure	10-15 / bar

Machine set up for Santex relax dryer is as follows:

Machine Parameters	Set-up Value
Temp. Setting	(100-110)°c for White Shade (110-120)°c for Light Shade (120-130)°c for Dark Shade
Blower Fan setting	Push Button switch on
Exhaust Fan setting	Push Button switch on
Machine Speed	1-12 m/min (depends on quality of fabric)
Over feed	0-45 % (depends on the fabric construction)

Slitter Machine

Slitter machine is used for tubular knit fabric to make it in open form. In open form fabric finishing line; slitter machine is used after hydro-extractor, de-watering and drying machine. Slitting is a process that is applied for cutting the tubular fabric through the intended break Wales line on lengthwise direction prior to stenter processing. During slitting, it is required to be aware about the cutting line otherwise, fabric faults can be occurred there.

Objectives of Slitting:

- To open tube fabric according to specific needle mark.
- To prepare the fabric for next stentering process.

Slitter Machine parts and their functions:

1. Rotary Blade: Rotary blade is used for cutting the fabric through break Wales line.

2. Ring: Ring is use to help the cutting process.

3. Guide Roller: After slitting, plaiting of the fabric is done. Guide roller guides the fabric to plaiting.

4. Plaiting: Open fabric is make plait by plaiting.

5. Sensor: Sensor is used for identify the specific Wales line. It makes sense for cutting through break Wales's line.

Checking Parameters:

1. *Cutting Line Check*: Fabric cutting line is checked by the operator of the slitting machine. Operator checks that the rotary blade cut fabric through break Wales's line or not.

2. *Bow and Slant check*: Bow and slant is checked in the delivery side of the machine by the

Manufacturer: **Bianka Slitter m/c (Germany)**

Speed: **20-25 m/min**

Stenter Machine

Stenter is used for open form fabric. After passing the open compactor, fabric enter into the stenter. Cotton fabric shrinks widthwise and weft distorted due to bleaching and dyeing process. The main function of the stenter is to stretch the fabric widthwise and to recover the uniform width.

Functions of Stenter:

1. Heat setting is done by the stenter for lycra fabric, synthetic and blended fabric.

2. Width of the fabric is controlled by the stenter.

3. Finishing chemical apply on fabric by the stenter.

4. Loop of the knit fabric is controlled.

5. Moisture of the fabric is controlled by the stenter.

6. Spirility controlled by the stenter.

7. GSM of the fabric is controlled by stenter.

8. Fabric is dried by the stentering process.

9. Shrinkage property of the fabric is controlled.

10. Curing treatment for resin, water repellent fabric is done by the stenter.

Machine Specification:

Brand Name :Bruckner

Serial no: 72276-0463

Origin: Germany

Year of manufacture: 1995

Speed range: 15-30 m/min

Temperature range 50-250C

Used utilities: Electricity, Gas, Compress air, Steam

Production capacities: 8 ton /day

No. of chamber: 3

Maximum fabris width: 102”

Minimum fabric witdth: 30”

Steam pressure: 2 bar

Air pressure: 10 bar

Applied for: Open tube fabric

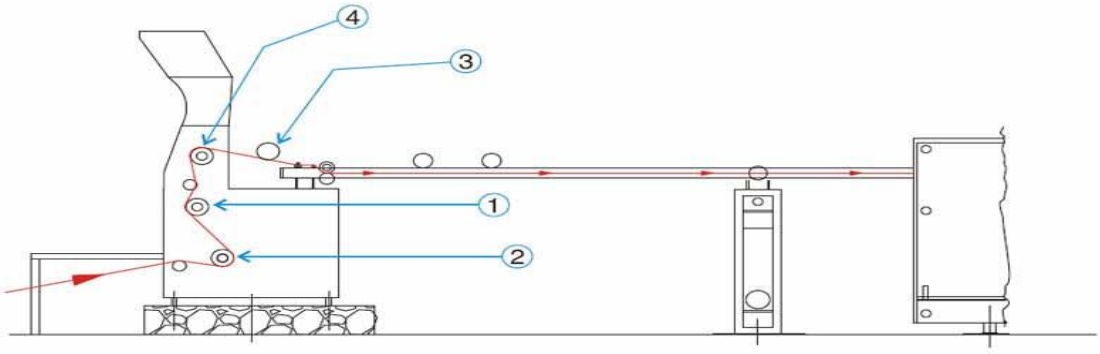
No. of ratamatic burner: 6

Extra Attachment: Mahlo weft straightener

M/C parts: Burner,Nozzle, Exhaust air fan, Over feed roller,

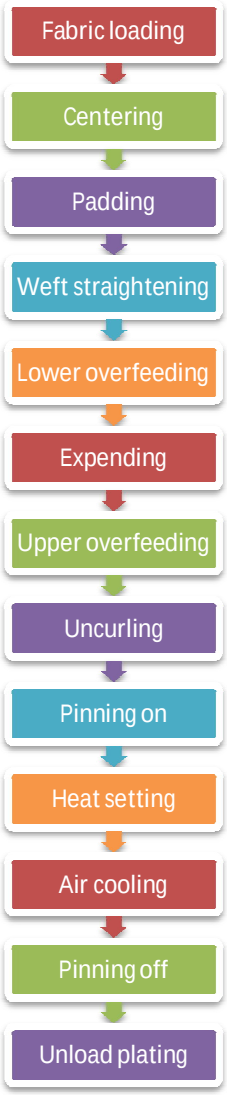
Suction fan, Chain arrangement

Process diagram:



1 = Scroll roller, 2 = Fabric tension roller, 3 = 2-finger uncurling device, 4= overfeeding roller.

Flow Chart of Stentering:



COMPACTOR MACHINE

Compactor machines are two types.

1. Tubular compactor

2. Open compactor

Tubular compactor is used after hydro-extractor, de-watering and dryer. By the compactor machine, compacting is done for control the shrinkage of the fabric. Here, different types of off line quality of the fabric are measured. Open compactor is used for compacting the open form fabric. Here, slitting machine is used for open the fabric from the tubular form.

Functions of tubular compactor:

1. Shrinkage of the fabric is controlled by the compactor.
2. Fabric width is controlled by the compactor.
3. GSM of the fabric is adjusted by the compacting.
4. Fabric smoothness is achieved by the compactor.
5. Heat setting of fabric for Lycra is done by tubular compactor.

Checking Parameters:

1. *Shade Check*: Shade of the compacting fabric is checked in the delivery side of the machine. The operator collects the fabric and compare the shade of the fabric with the buyer's approved swatch.
2. *Width Check*: Operator measures the width of the fabric with the measuring tape and compares it with the buyer's requirement.
3. *Weight Check*: Weight of the fabric is determined by GSM check. Operator checks the GSM of
the fabric by GSM cutter and electric balance.
4. *Edge Line Checking*: Two edges of the fabric is check in delivery side. If any fix line is identified, which normally occurs from the expander it should be connected.
5. *Design and Slanting*: Operator checks design and slanting of the fabric in the delivery side of the machine.
6. *Fabric Faults*: Various types of fabric quality are measured in the delivery side of the fabric.

Machine set up for Feraro open compactor is as follows:

Machine Parameters	Set-up Value
Steam pressure	4 - 6 bar
Air pressure	5 bar
Temp.	70 - 100°c
Cooling fan motor	Auto
Width of Expreader Setting	36 ‘’- 100’’ (always set the expreader width higher than the required width)
Overfeed	-10% to +40 % (depends on the fabric requirement)
Speed Setting	5 – 25 m/min (depends on the structure of fabric)

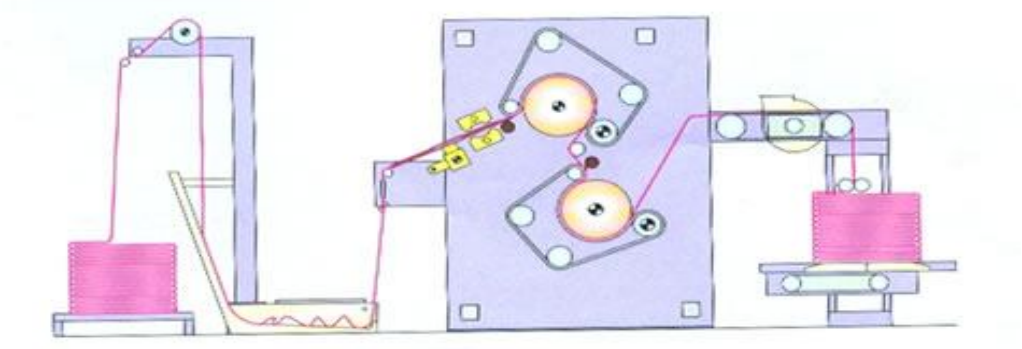


Fig: Tubular compactor

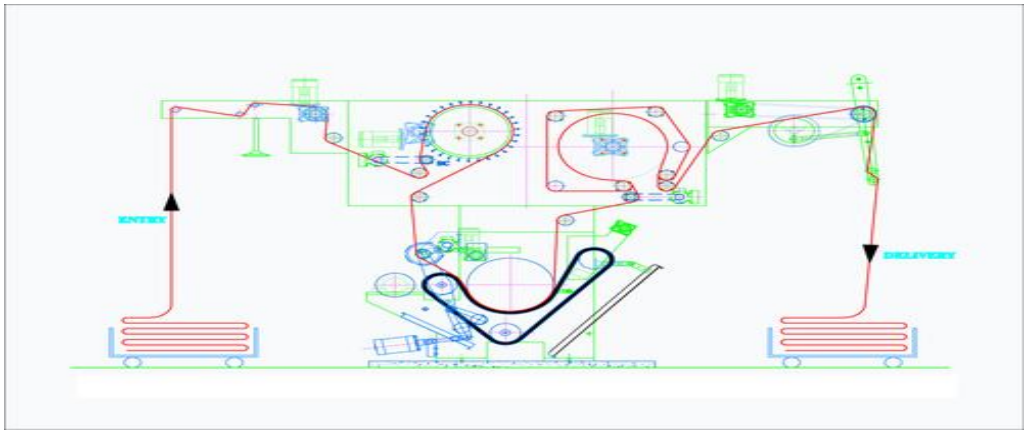


Fig: Open with Compactor

CONCLUSION

Industrial attachment program send us to the expected destiny of practical life. Through The completion of Two Month industrial attachment at **The Delta Composite Knitting Ind. Ltd (DCKIL)**, we have got the impression that the factory is one of the most knit dyeing projects in Bangladesh. Though it was established 15 years ago, it has earned very good reputation for its best performance over any other knit dyeing project.

During our industrial attachment program we had tried to our best to done our duty. Our supervising officer also satisfied to us & offer co-operation in every steps. It is completely a new experience in our life, which will be very effective in our service life. During our training period we realized that practical experience is valuable for service life.