Industrial Attachment

REPORT ON

The Immaculate Textile Ltd

Course Title: Industrial Attachment

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Acknowledgement

At first my gratefulness goes to Almighty Allah to give my strength and ability to complete the industrial training and this report. may you name be exalted, honored and glorified.

Now I wish to take this excellent opportunity to thank a lot of people who have assisted and inspired me in the completion of my training period Mr. Asit Ghosh my supervisor, to whom I am extremely indebted for her tremendous support and guidance throughout my training period. Being working with him I have not only earned valuable knowledge but was also inspired by her innovativeness which helped enrich my experience to a greater extent. Her ideas and way of working was truly remarkable.

We would like to thank the management of The Immaculate Textile ltd. for giving me the opportunity to do the industrial training successfully and also their valuable suggestions. My deepest appreciation goes to MD. Akher Hossain, Manager, HR admin & Compliance , The Immaculate Textile Ltd. for his permission to conduct our industrial training without which it would be uncompleted. The generous support is greatly appreciated. I would also like to thank executives, senior executives and other officials of The Immaculate Textile Ltd. for helping me to complete industrial training successfully. My gratitude also goes to all the employees of the immaculate Textile Ltd. for their sincere co-operation, support and valuable advices.

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Chapter 1

Introduction

Textile and RMG (Ready Made Garments) are leading export-led industries in Bangladesh, in respect of foreign currency earning and employment. Recently, in the past-MFA era, the composite knitting industries are playing the crucial roles in country's RMG sector. Among Them, The Immaculate Textile Ltd. has occupied a pivotal Place.

The Immaculate is a composite unit, having knitting, dyeing, finishing and sewing units under a single roof. Beside All these unit work as an integrated whole to meet the buyer's stipulated time and need based demands.

The factory is located at Dhamrai, Dhaka. 1 hour and 30 minutes drive from the Daffodil International University, Dhaka. The total factory space is 256332 sq ft, including two 2-storied building. The factory arena is highly protected with boundary walls and private security guards.

Next to its security measures, the factory is well equipped and furnished with enough fire-fighting equipment, fire alarms systems and trained personnel for the facilitating emergency evacuation. All of which contribute to minimizing the fire-risks. The factory environment, with excellent lighting and ventilation, is one of the best of its kind in Bangladesh.

The Immaculate believes that the accumulation of individual efficiencies is the assets of the whole company. Accordingly, we try to reciprocate to the individual well being of all our 1100 employees. So the factory provides pure drinking water facilities, worker's launch-room and sufficient number of toilets.

Company profile

Name: The Immaculate Textile Ltd

Type: Knit Composite

Sister Organization:

- The Immaculate Textile Ltd.
- The Immaculate (Pvt) Ltd.
- The Immaculate Apparels Ltd.
- The Immaculate Exports Ltd.
- The Immaculate Accessories Ltd.

Certified Achievement: ISO 9001 : 2008 (Certified)

Manufacturing products: Export oriented knit fabrics & readymade garments.

Location of head office: C - 35 , Section- 7, Mirpur, Dhaka, Banglades

Location of the factory: Noyarhat bazaar, Islampur, Dhamrai, Dhaka

Email Address: Rubel@immaculatetex.com (EO), Akhter@immaculatetex.com (GM-production)

Covered area of factory premises: 7 acres

Number of Units: 3 unites

Corresponding Bank: AB Bank Limited
Karwan bazaar Branch,
Dhaka, Bangladesh

Telephone Numbers: (880)-2-8011837, 9002099 , 8011330.

Website: http://www.immaculateltd.com

Customer profile:

USA	:	Gymboree, Xanaka, Viva Cotton, Sams Club, Kids H/Q
GERMANY	:	C&A, Tom Tailor
SPAIN	:	Zara
UK	:	Matalan
ITALY	:	Terranova
FRANCE	:	Pimkie, Monoprix, Carrefour Kiabi, Spring Field
TURKEY	:	Tema
CANADA	:	Wal-Mart
SWEEDEN	:	New Wave Group

Chapter-2

Planning Section

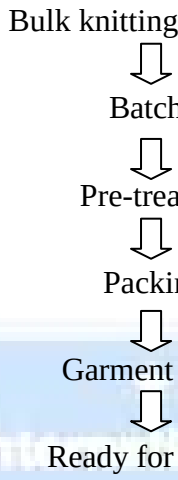
Introduction and Basic Procedure of Planning and Control:

A planned work brings success. Without planning nothing is completed within the required time. So planning has its own importance which is intolerable. “Planning” gives a scheduled task and “Control” completes it successfully. But production planning and control is not an easy task. So Micro Fiber Group has a high-performance department called “Production Planning & Control”. Its Basic working procedure as follows-

1. Taking orders form marketing division.
2. Analyzing the orders.
3. Planning for knitting the fabric.
4. Planning for dyeing the fabric.
5. Planning for finishing the fabric.

It is only a basic procedure. It may change according to the type of order. Sometimes, order is places only for finishing the material or only for dyeing the white goods. Then some steps are omitted for planning procedure.

Production Planning:



Costing system mainly describes how the cost of the final product is fixed by the company beneficial. According to buyer/customers requirement at first the fabric is collected from local and foreign supplies. Then it id calculated how much dyestuff and chemical is required to the end of the processing of that specific fabric. After that, the final cost is fixed including some profit. Then the until price is offered to the buyer for approves it.

Point for costing:

The following points are considered for costing any dyed product in Micro Fiber Group:

1. Total dyes & chemical cost
2. Total utility cost
3. Salary
4. Payment
5. Transport cost
6. Lunch
7. Entertainment cost
8. Miscellaneous cost
9. Government cash incentive

Price of the product:

Generally price of product is determined by the required profit adding to the total expense.

So,
price of products = (Direct expense + Indirect expenses + Factory Overhead) + Required Profit

Production Cost:

Knitting Charge of Different Fabrics:

Fabric name	Charge per kg(TK)
1. Single Jersey	09
2. Single Jersey with Lycra	30
3. Single locust PK	16
4. Double locust PK	16
5. Single PK	16
6. Double PK	16
7. Rib	17
8. Rib with Lycra	30
9. Interlock	25
10. Auto striper	80
11. Auto striper with Lycra	100
12. Fleece	22-25

Dyeing Charge of Different Fabrics:

Name of fabric process	Charge per kg(TK)
1. White with Enzyme	35
2. White without Enzyme	30
3. Avg. color with Enzyme	85
4. Avg. color without Enzyme (Light & med.)	75
5. Deep shed with Enzyme (Black)	110
6. Deep shed without Enzyme (Black)	95
7. Only wash (Tubular)	25
8. Only wash (Open)	45
9. Double dyeing (Face & Back)	115

Finishing Charge of Different Fabrics:

Name of fabric process	Charge per kg(TK)
1. Slitting only	5
2. Heat set	15
3. Stenter only	25
4. Compacting only	15
5. Stenter + Compacting	35
6. Stenter + Compacting + Wash	50
7. Tube Compacting	10

Costing Of the Product:

Let price of yarn is = $ 3.00/kg.

Process loss of yarn for knitting (10%) = $ 0.30

Knitting fabric cost = $ 3.00 + $ 0.30 = $ 3.30

Cost of dyes & chemicals = $ 2.50

Process loss for dyeing (12%) = $ 0.30

Dyed fabric cost = $ 3.50 + $2.50 + $ 0.30 = $ 6.10

Packing cost = $ 0.05

Production cost of fabric = $ 6.10 + $ 0.05 = $ 6.15

Fabric price (with 25% margin) = $ 6.15 + ($ 6.15 X 25%) = $ 7.69

Chapter-3

Knitting Section

Knitting Section (circular knitting m/c)

M/C No	Name of The machine	Dia	GG	Brand	Origin
01	Single jersey	30"	24	Fukuhara	Japan
02	Single jersey	30"	24	Fukuhara	Japan
03	Single jersey	30"	24	Fukuhara	Japan
04	Single jersey	30"	24	Fukuhara	Japan
05	Single jersey	30"	24	Fukuhara	Japan
06	Single jersey	30"	24	Fukuhara	Japan
07	Single jersey	30"	24	Fukuhara	Japan
08	Single jersey	34"	24	Fukuhara	Japan
09	Single jersey	34"	24	Fukuhara	Japan
10	Single jersey	34"	24	Fukuhara	Japan
11	Single jersey	36"	24	Fukuhara	Japan
12	Single jersey	36"	24	Fukuhara	Japan
13	Rib	34"	18	Fukuhara	Japan
14	Rib	34"	18	Fukuhara	Japan
15	Rib	34"	18	Fukuhara	Japan
16	Interlock	34"	24	Fukuhara	Japan
17	Interlock	34"	24	Fukuhara	Japan
18	Interlock	34"	24	Fukuhara	Japan
19	Interlock	34"	24	Fukuhara	Japan

Knitting section (Flat bed/v-bed knitting m/c)

M/C No	Name of the machine	Dia	GG	Brand	Origin
01	Flat bed	54"	14	Matsua	Japan
02	”	54"	14	Matsua	Japan
03	”	54"	14	Matsua	Japan
04	”	54"	14	Matsua	Japan
05	”	54"	14	Matsua	Japan

Figure: Single jersey Circular Knitting machine

Figure: Rib Circular Knitting machine

Figure: Interlock Circular Knitting machine

Figure: V-bed Flat knitting machine

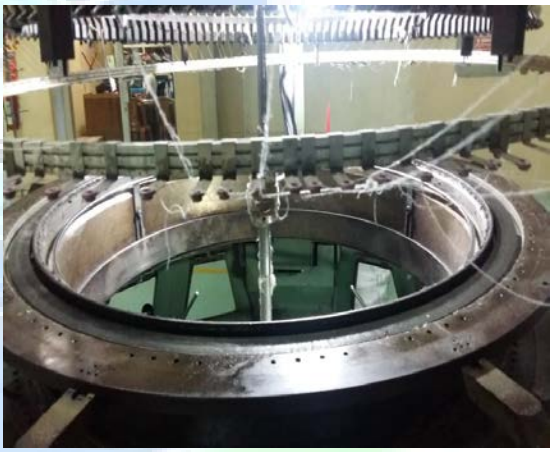


Photo: Cam box and cylinder dial

Photo: Knitting section

Different parts of knitting machine:

- Start/Stop/Inch bottons: This set of bottons is used to start/stop/slow running of machine
- Ratchet lever: This lever permit the hand movement of the machine
- Auto stop motion: Automatic three stages 24v yarn motion, positive feed tapes & knitting zone. Indicator lamps are on individual stop motions & on the main control panel. While the yarn is broken we can find the location which is broken as well as to repair, meanwhile the motor can brake & stop operation at once to keep the security of the machine.
- Side creel: For each feed, there are two cones of yarn on the creel. Creel is used to place the cone
- Tensioning device: The yarn goes to the of the machine from the creel through different tensioning devices. This devices are used to maintain the proper tension of the yarn.
- Feeder: Feeder is used to feed the yarn.
- VDQ pulley: This is one of the important parts of the machine. VDQ pulley is used to control the GSM by controlling the stitch length. If the value of the VDQ pulley is increased, then the loop length of the fabric will be less and the GSM of the fabric will be high. Vice versa for make low GSM fabric.
- Guide: Guide is used to guide the yarn.
- Sensor: Sensor is use to seen & the machine stops when any problem occurs.
- Spreader: Spreader is used to spread the knitted fabric before take up roller.
- Auto Counter: Two shift revolution with display counter with predetermined stop, to settle freely the weight or yardage of fabric.
- Variable speed drive with machine break: Transistor inverter provided for free controlled, the process of V.S. motor-drive from slow operation to normal operation is quite & first break to prevent damages in case of needles & yarn breakage.
- Fabric take up system: With variable speed control by a belt drive set can be adjusted the speed for different course of fabric constant and uniform fabric tension.
- Rethom: These device are used in Electrical Auto striper knitting machine.
- Take up roller: Take up roller used to take up the fabric.
- Fixation feeder: These types of feeder are used in Electrical Auto Striper knitting machine to feed the yarn at specific finger.

Typical Parameter at knitting section:

- Yarn count
- GSM
- Stitch length

Final products of Circular Knitting Machine:

Product of Single Jersey machine:

1. S/J Plain
2. Single Lacoste
3. Double Lacoste
4. Single pique
5. Double pique
6. Terry

Product of Interlock machine:

1. Interlock pique
2. Eyelet fabric
3. Mash fabric

Product Of Rib machine:

1. 1*1 Rib fabric
2. 2*2 Rib fabric

Finish products of Flat Bed Knitting Machine:

1. Collar.
2. Cuff.

Knitting:

Sara J Kadolph stated that “Knitting is fabrication process in which needles are used to form a series of interlocking loop from one or more yarns or for a set of yarns.
The two basic types of knitted fabrics are named after the general direction of loop formation in the fabric. In weft knitting the yarn is introduced in a weft wise direction, at right angles to the direction of fabric growth. In warp knitting the yarn follows a warp wise progression.

Wales:

A wales is a predominately vertical column of needle loops generally produced by the adjacent needle during the same knitting cycle.

Course:

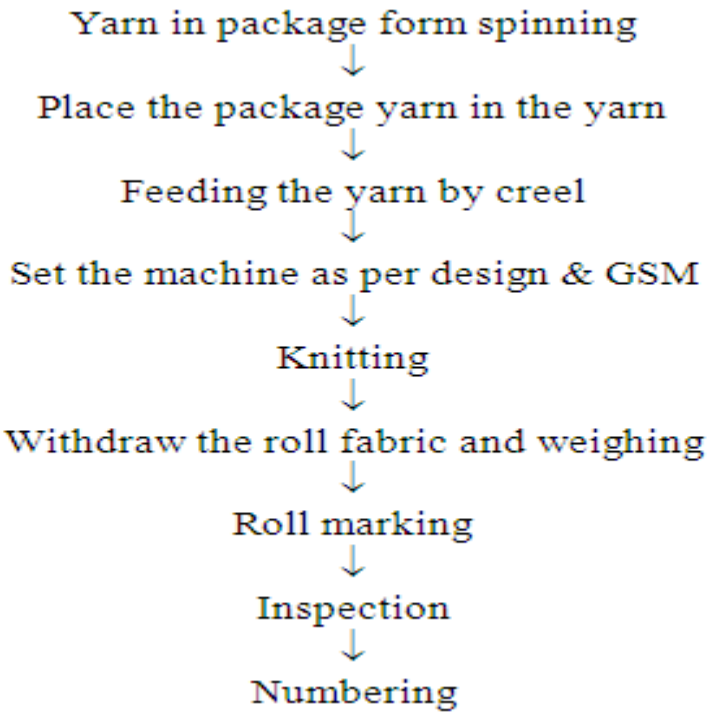
A course is a predominantly horizontal row of intermeshed needle loops generally produced by the same knitting at successive knitting cycle.

2.1.3 Stitch:

Stitch is the smallest dimensional stable unit of all weft knitted fabric. It consist of A headTwo side legs or limbsFeet.

GSM:GSM is a very important parameter for specified a certain quality of knitted fabric. The production of knitted fabric is calculated in weight. The GSM cutter is very popular and easy usable GSM testing instrument used in most knitted factory. But the construction of this cutter is very simple. It is circular disk of 100 square cm area with sharp blade attached to its edge. So 100 square cm of fabric can easily cut by it and weighted at the electric balance to get GSM reading.

Knitting process flow chart:



Definition of knitting:

Knitting is the operational way of making fabric by interloping yarns. Knitting is a technique to turn thread or yarn into a piece of cloth. There are two types of knitting where one is warp knitting and another one is weft knitting.

Weft knitting:

Weft Knitting is a method of forming a fabric in which the loops are made in horizontal way from a single yarn and intermeshing of loops take place in a circular or flat form on across wise basis.

Warp Knitting:

Warp Knitting is a method of forming a fabric in which the loops are made in vertical way along the length of the fabric from each warp yarns and intermeshing of loops take place in a flat form of length wise basis.

Basic Knit Stitches in weft Knitting:

As there are two type of knitting, warp knitting and weft knitting. Both are consist of a repertoire of interlinked loops of yarn and were based on three basic elements in weft knitting, they are knit, tuck and miss stitch respectively.

I) Knit Stitch

It is the basic stitch used in weft knitting. This kind of stitch represents two different faces accordingly to its relative position of the producing needle and fabric. The knitted fabric has been constructed normally more elongation in crosswise and less elongation in lengthwise.

II) Tuck stitch

A tuck stitch means an elongated loop when a needle rises to take a new yarn by the needles without casting off the old loop. An elongated loop is created which one needle gets two or more stitch without clearing form the needles. On the technical back side, tuck loop will be hidden. As a result, the knitted fabric will be resulted thicker and heavier. It can be used to produce color patterns to make open work.

III) Miss Stitch

Miss stitch is formed at the needle by the abutting needle when the new stitch is created during the production sequences. That means a needle is inactive when knitting. Miss loops cannot be seen from the technical face side of the fabric and cannot be formed alone into a fabric without knitted loops.

Fabric width:

Two types of fabric width

1) Open width
2) Tubular width

Open width:

- Mark line contains for fabric cutting
- Fabric dyes in open form
- Open width is double than tubular width
- For single jersey.

Tubular width:

- No mark line.
- Fabric dyes in tubular form
- Tubular width= half open width
- For Rib. Interlock

Types of yarn:

1. Combed
2. Carded (30s, 34s,)

   CVC = Chief Value of Cotton (60% Cotton + 40% polyester)
   (65% Cotton + 35% Polyester)
   (70% Cotton + 40% Cotton)

   PC = Polyester Cotton (60% Polyester + 40% Cotton)

Considerable points to produce knitted fabric:

Knit fabrics are the fashion of modern age. Various designed fabrics are produced in knitting machine. Knitting flow chart should follow during operation. During production process following machine parameters are considered,

- Machine Diameter
- Machine RPM
- No of feeder
- Machine gauge
- Count of yarn
- Required Time
- Machine efficiency.
- Stitch length.
- GSM

Generally knit fabric production runs accordingly to the order of buyer. When a buyer orders for fabric, they mention some points related to production and end product quality Before production of knitted fabrics, these factors are needed to consider. Those are:

01. Type of fabric or design of fabric.
02. Finished GSM
03. Yarn Count
04. Diameter of fabric.
05. Stitch length & color depth.

Factors that should be considered for changing of fabric design:

- Cam arrangement changing.
- Needle butt setting & needle dropping.
- Using of different colors in selected feeder.
- Using of jacquard mechanism.
- Size of the loop shape.

Fabric Inspection:

Two ways of gray fabric inspection used to done by

a) Auto turning machine
b) Virivide color assessment cabinate-2 (D-65, TL-83, Florescent, UV)

Some Knitting calculation:

Production per shift for single jersey in kg

$$= \frac{\pi DG \times S.L\,(mm) \times \text{No. of feeder} \times RPM \times 60 \times 8 \times \text{Efficiency} \times \text{Feeder/course}}{2.54 \times 36 \times 840 \times Ne \times 2.2046} \text{ (kg)}$$

Production per shift for single jersey in yards

$$= \frac{\text{No. of course per min}}{\text{No. of course per inch}} \times \text{Machine efficiency}$$

Or,

$$= \frac{\text{Number of feeder} \times \text{machine speed} \times \text{time} \times \text{efficiency}}{CPI \times 36} \text{ (in meter)}$$

Fabric & specification:

Plain single jersey:

- Appearance of face and back are different.
- Wales are clearly visible on the face side of the fabric.
- Extensibility in widthwise is approximately twice than lengthwise.
- Curl or roll of fabric occurs at the edges.
- Unraveling of fabrics occurs by course from either side is possible.
- Thickness of fabric is approximately twice the diameter of yarn used.
- There is only one row of knitted loops per course in the fabric.

Lycra single jersey:

All the characteristics are the same as plain single jersey. Additional feature is to initiate a lycra yarn with the cotton yarn. It may be fed with every feeder or every alternate feeder. The most widely used counts of spandex yarn are 20 denier & 40 denier. The weight of lycra is only 2.5% to 5% on the total weight of fabric. The fabric is known for its outstanding elasticity.

Single lacoste:

- It is a single jersey derivative.
- It is four course repeat structure.
- The structure contains 75% knit loop and 25% tuck loop.
- The fabric is widely used for polo shirt production.
- Feed-1: Alternate knit and tuck loop.
  Feed-2: All knit loop
  Feed-3: Alternate tuck and knit loop.
  Feed-4: All knit loops.

Polo Pique:

- It is a single jersey derivative.
- It is four repeat structure.
- The structure contains 50% knit loop and 50% tuck loop.
- Widely used for polo shirt making.
- Feed-1,2 Alternate knit and tuck loop.
  Feed-3,4 Alternate tuck and knit loop.

1×1 Interlock:

- Interlock has the technical face of plain fabric on both sides.
- The wales on each side are exactly opposite to each other and are locked together.
- Each repeat requires two feeder courses, thus odd feeders produce alternate wales of loops on each side and even feeders produce the other wales.
- Two yarns must be removed to unravel a complete repeat of knitted course.
- It is a balanced, smooth, stable structure that lies flat without curl.
- It will not unravel from the end knitted first but it is thicker, heavier and narrower than rib of equivalent gauge.
- When two different colored yarns are used, horizontal effects are produced if the same color is knitted at two adjacent feeders.

1×1 Rib:

- The appearance of face and back are identical.
- Fabric length wise and widthwise extensibility is approximately twice than that of single jersey.
- Fabric does not curl at edges.
- Fabric thickness is approximately twice than that of single jersey.
- There are two series of knitted loops arranged into two parallel lines in a course.
- Combination of wales of face loops and back loops are present on the both side of the fabric but exist in alternately.

2×2 Rib:

- The structure can be produced by removing out every third needle from the cylinder and dial.
- The reversible fabric has vertical rib design effect, which is slightly wider ribbed effect than 1×1 ribs.
- There are two wales of knit stitches alternating with two wales of purl stitches.

Flat back rib:

- It is an interlock derivative produced in interlock circular knitting machine.
- Each repeat contains three course.
- Feed-1: Knit on the short needles of cylinder. No knitting on dial needles.
  Feed-2: Knit on all te needles of dial and no kniiting on cylinder needles.
  Feed-3: Knit on selected short dial needles and tuck on short cylinder needles.

Raw materials for knitting:

Type of yarn	Count
Cotton	**24^S, 26^S, 28^S, 30^S, 32^S, 34^S, 40^S**
Polyester	**75D, 72D,100D**
Spandex yarn	**20D,40D, 70D**
Grey Mélange (C-90% V-10%)	**24^S, 26^S**
PC	**24^S, 26^S, 28^S, 30^S**
CVC	**24^S, 26^S, 28^S, 30^S**

Minimum requirement of other parameters are :

For Yarn:

1. Yarn strength 13 gm/Tex (minimum)
2. Should be waxed 0.1% - 0.3% (on the weight of the material)
3. Yarn should not be dry
4. Cone angle should be accurate
5. A tail should be kept during winding
6. Packing density must be maintained

For Spandex

1. Should have good elasticity
2. Yarn should be uniform
3. Elastic recovery 100%
4. Elongation 500%.
5. Should be Acid, Alkali and temperature stable

Knitting Machine Set-up In accordance with Yarn:

Parameters	Range
Speed	26 ~ 28 RPM (for Solid dyed)
	20 ~ 25 RPM (for Yarn dyed & designed)
Yarn Tension	4 ~ 5 gm/tex.
Stitch Length	2.60 ~3.00 mm
Weight	100 ~ 240 GSM (as requested)
Yarn (Cotton)	16 ~ 40 Ne
Yarn (Polyester)	75 ~ 300 Denier

Some points are needed to maintain for high quality fabric:

a) Finer quality of yarn.
b) High efficiency machines.
c) Accurate controlled G.S.M, Stitch length, Tensions .
d) Well maintained machine and servicing is done regularly.
e) Quality inspection system.

Relationship between knitting parameter:

- If stitch length increase than GSM decrease.
- If stitch length increase then fabric width increase and Wales per inch decrease.
- If machine gauge increase then fabric width decrease.
- If yarn count increase then fabric width increase.
- If shrinkage increases then fabric width decrease but GSM and Wales per inches increase.
- For more finer gauge, finer count yarn should use.

Count ranges are used to require GSM :

For Single jersey without lycra:

GSM	Count
110-120	**40s-36s**
120-130	**36s-32s**
130-140	**32s-28s**
140-150	**26s**
150-160	**26s**
160-170	**24s**

For Single jersey with lycra:

GSM	Count
240-250	26s
220-240	28s
210-220	30s
190-210	32s
180-190	34s

For Rib

GSM	Count
250-300	24s
200-215	28s
230-250	24s
210-230	26s
190-200	30s
180-190	32s

For Single jersey with lycra

GSM	Count
200-220	**34s**
220-230	**32s**
230-250	**30s**
250-300	**26s**

Knitting fabric fault:

Faults in circular knitting production can be caused in various ways and quite a few of them cannot be related to just one cause. The following explanations are expected to be helpful in trying to locate the cause of these faults easier.

Reason of fabric faults:

- Yarn manufacturing faults
- Fabric manufacturing faults
- Fabric processing faults – dyeing, printing or finishing faults

Sources of fabric faults:

The sources of faults could be (in circular knitting machine, 80% faults come from yarn)

- Faults in yarn and the yarn package
- Yarn feeding and yarn feed regulator
- Machine setting and pattern defects
- Machine maintenance
- Climatic conditions in the knitting plant

Fabric faults:

Knitted fabric faults are very different in nature and appearance and are often superimposed. The most common faults are:

- Broken ends, holes or cracks
- Drop stitch
- Cloth fall-out or pressed-off stitches
- Bunching—up
- Vertical stripes
- Horizontal stripes
- Soil stripes
- Color fly or colored tinges
- Distorted stitches or deformed or tilted loops

Holes:

Holes are the results of cracks or yarn breakages. During stitch formation the yarn had already broken in the region of the needle hook. Depending on the knitted structure, yarn count, machine gauge and course density, the holes have different sizes. The size can therefore only be estimated if the comparable final appearance of a comparable fabric is known.

Possible causes:

- Yarn parameters
- High yarn irregularity
- Incorrect yarn input tension setting, yarn running-in tension is too high
- Poorly lubricated yarns
- Weak places in yarn, which break during stitch formation
- Knots, slubs etc
- Yarn is too dry
- If the yarn is trapped between the check taper and the closing latch
- Yarn damage
- Too small stitches
- Difficult in casting-off of the stitches
- Relation between cylinder and dial loop not correct; yarn feeder badly set, defective knitting elements.

Drop stitches:

These are the result of a defective needle. They also occur when a yarn is not properly fed during stitch formation. These are the unlinked knitted loops.

Possible causes:

a) Inaccurate insertion of the yarn into the needle hook;

   Closed latch – a wale of dropped stitches will be produced until the latch is opened either by the operator or due to machine vibration.

b) Broken needle hook;

c) Due to high yarn twist and low fabric take-down-tension the knitted loop could fall out of the hook.

d) Improper setting of the yarn feed angle

   i) badly set yarn feeder

   ii) The yarn is not caught by the needle hook.

e) Yarn feeder wrongly threaded-in

f) Dial loop length not properly related to cylinder loop length. The loop jumps out the needle hook

g) Bad take-up

h) Very dry material

i) Insufficient yarn tension.

Cloth fall-out or pressed-off stitches:

It is an area consisting of drop stitches lying side by side. They can occur either when a yarn is laid-out or when it breaks without any immediate connection. Cloth fall-out can occur after a drop stitch especially when an empty needle with closed latch runs into the yarn feeder and removes the yarn out of the hooks of the following needle.

Possible causes:

- Yarn breaks before the yarn feeder
- Yarn package winding faults, poor package build-up;
- Fiber fly block the yarn guides, feeders etc.

Needle marks or Vertical stripes:

Vertical strips can be observed as longitudinal gaps in the fabric. The space between adjacent wales is irregular and the closed appearance of the fabric broken up in an unsightly manner. Vertical stripes and gaps in the fabric are often the result of the meager setting, the yarn count selected is too fine for the machine gauge or the stitch size (course density) is not correct. Needles are bent, damaged, do not move uniformly smooth, come from different suppliers or are differently constructed.

Possible causes:

- Twisted or bent needle hooks.
- Stiff latches and needles.
- Incorrect closing of the hook by the latch.
- Heavily running needles.
- Damaged dial and cylinder.
- Damaged needle latch and needle hooks.
- Damages on other knitting elements.

Horizontal Stripes:

These are caused by unevenness in the courses; they traverse horizontally and repeat themselves regularly or irregularly.

Possible causes:

- Deflector not completely switched off. Needle can still grip the yarn and forms tuck loop.
- Yarn feeder badly set.
- Differences in the yarn running-in tension.

Barrenness:

Possible causes:

- Individual yarns differ with respect to count, properties or structure;
- Different course lengths in feeders.
- Color Barrenness
- Possible causes:
- Knitting of yarns which differ in color;
- Yarns dye differently during piece dyeing.
- Shadow Barrenness
- Shadow like changes in the appearance of the fabric. Very difficult to detect and done by reflected light.

Bunching-up to Thick and Thin Places:

Visible knots in the fabric are referred to as bunching up. They appear as beads and turn up irregularly in the fabric. More irregular the yarn, more pronounced is the “cloudy” appearance.

Possible cause:

- Thick and thin places in the yarn;
- Fabric take-up too weak.

Affinity among yarn count, machine diameter, gauge, stitch length, finished GSM and finished Dia:

Fabric Type	Yarn Count	Machine Dia×Gauge	S/L	Finish Dia	Color	Finish GSM
Plain S/J	18	26×24	2.90	30	white	230
”	20	30×24	2.84	33	white	210
,,	24	30×24	2.68	32	white	190
,,	26	30×24	2.66	31	white	170
,,	28	26×24	2.70	30	Dyed	160
,,	30	30×24	2.68	30	Dyed	140
1×1 Rib	26	40×18	2.50	41	Avg	245
,,	24	30×18	2.75	64	Avg	230
,,	26	40×18	2.54	40	Avg	240
,,	26	40×18	2.55	47	Avg	235
,,	26	32×18	2.65	32	Avg	225
,,	36	32×18	2.66	33	Avg	175

’’	24	34×18	2.85	32	Avg	220
’’	24	40×18	2.58	38.5	Avg	225
’’	28	30×24	2.40	23	Avg	230

2×2 rib	40	30×20	2.75	35T	Avg	160
’’	28	34×18	2.85	32T	Avg	250
’’	26	34×18	3.00	31T	Avg	200
’’	24	34×18	3.50	31.5T	Avg	280
’’	20	34×20	3.25	550P	Avg	260

SAMPLE OF VARIOUS TYPE OF KNITTED FABRIC:

Daffodil International University
D I U

Chapter 4

Batching

Batching:

Batching is the process to get ready the fabrics which should be dyed and processed for a particular lot of a particular order.

Function or Purpose of Batch Section:

- To receive the grey fabric roll from knitting section or other source.
- Turn the grey fabric if require.
- To prepare the batch of fabric for dyeing according to the following criteria –
    - Order sheet (Received from buyer)
    - Dyeing shade (color or white, light or dark)
    - M/C capacity
    - M/C available
    - Type of fabrics(100% cotton, PE, PC, CVC)
    - Emergency
- To send the grey fabric to the dyeing floor with batch card.
- To keep records for every previous dyeing.

Proper batching criteria:

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

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.

Type of Batch:

Solid Batch: In solid batch all sample are same size, same diameter, same GSM, same fabric. For example; GSM is 160, diameter is 60”, and fabric type is single jersey.

Ratio Batch: In solid batch sample are different size, different diameter, different GSM, different fabric. For example; GSM are 160; 180; 200; diameter are 45”; 50”; 56”; 60”, fabric type is single jersey; (1*1) rib; (2*2) rib; (1*1) interlock, color size are (38*9; 40*9; 42*9; 45*9), cuff size are (38*3; 39*3; 40*3; 42.5*3).

Considerable point: Batch selection depends on Fabric GSM.

Fabrics Faults Identification:

Hole Mark

Causes:

- Holes are the results of yarn breakage or yarn cracks.
- During loop formation the yarn breaks in the rejoin of the needle hook.
- Badly knot or splicing.
- Yarn feeder badly set.

- Yarn strength must be sufficient to withstand the stretch as well as uniform.
- Use proper count of yarn.

Needle Mark

Causes:

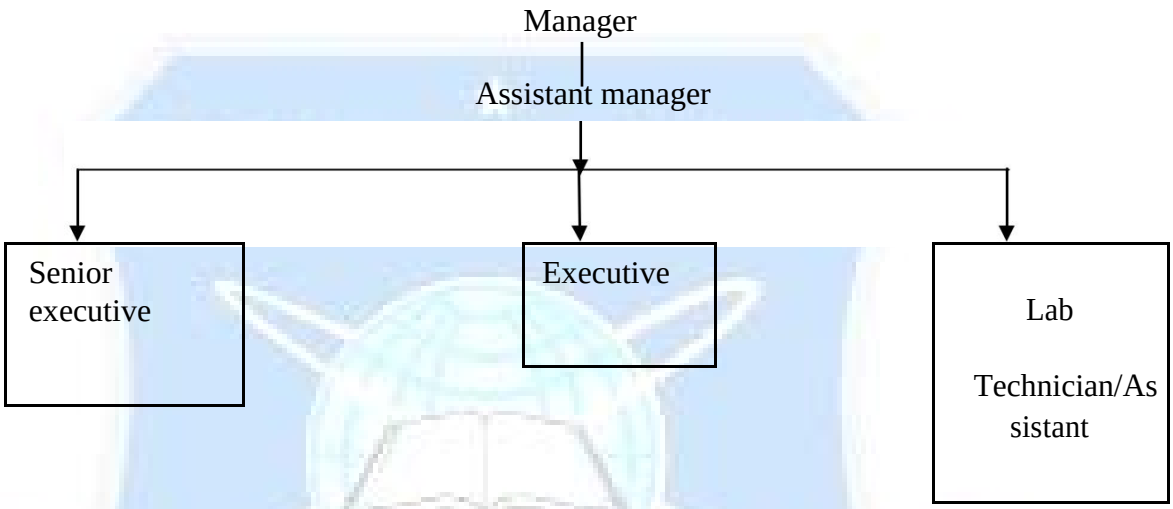
- When a needle breaks down then needle mark comes along the fabrics.
- If a needle or needle hook is slightly bends then needle mark comes on the fabrics.
- Needle should be straight as well as from broken latch.

Sinker Mark

- When sinker corrode due to abrasion then some times can not hold a new loop as a result sinker mark comes.
- If sinker head bend then sinker mark comes.
- Sinker should be changed.

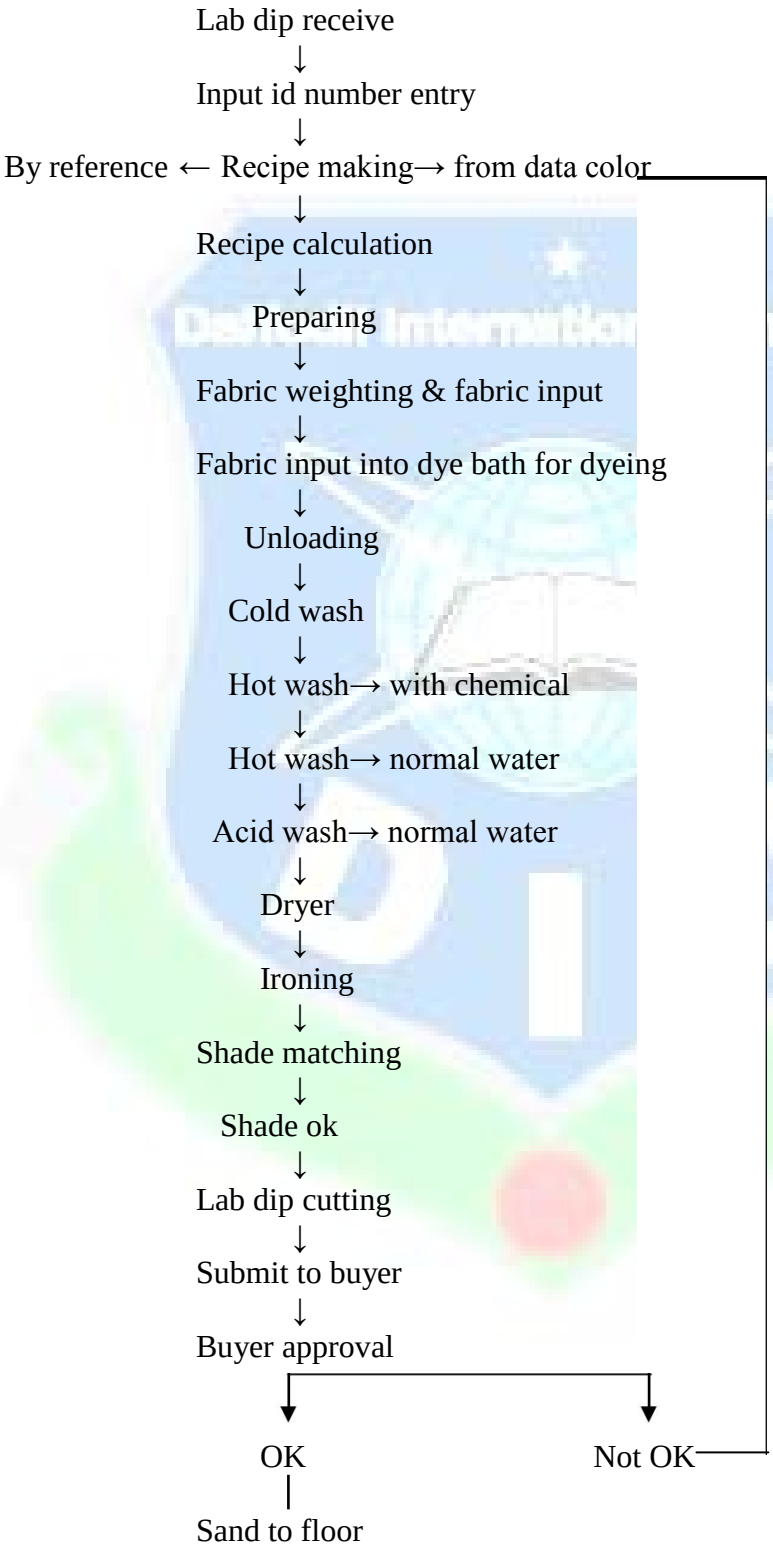
Chapter 5
Laboratory

Lab Organ gram:



Lab dip: Lab dip is a process by which buyers supplied swatch is matched with the varying dyes percentage in the laboratory with or without help of "DATA COLOR" Lab dip plays an important role in shade matching & and detaching the characteristics of the dyes and chemicals are to be used in the large scale of production so this is an important task before bulk production.

Lab Dip Procedure:



Online Tests:

- Dyed fabric
- Shade check
- Wash fastness
- Water fastness
- Crocking fastness

Off-line Tests:

Off-line tests for finished fabrics are divided into two groups. There are as follows:

1. Physical Test
2. Chemical Test

Physical Test:

- GSM of fabric.
- Abrasion resistance / Pilling.
- Dimensional stability test.
- Spirality test.
- Color fastness to rubbing test (Dry / Wet).
- Brushing strength test (For knitted fabric).

Chemical Test:

- Color fastness to washing.
- Color fastness to light.
- Color fastness to heat.
- Color fastness to actual laundering.
- Color fastness to chlorinated water.
- Color fastness to water spotting.
- Color fastness to perspiration.
- Color fastness to seawater.
- Flammability test.
- Fiber analysis.
- pH test.
- Phenol yellowing.

Available Stock Solutions:

Red – 0.1%, 0.5%, 1.0%, 2.0% (very common)
Yellow – 0.1%, 0.5%, 1.0%, 2.0% (very common)
Blue - 0.1%, 0.5%, 1.0%, 2.0% (very common).

Preparation:

To prepare 0.1% Stock solution, it is necessary to mix 0.1 g dye and 100 cc water.

To prepare 0.5% Stock solution, 0.5 g dye stuff is mixed with 100 cc water.

To prepare 1.0% & 2.0% Stock solution similar procedure is followed.

To prepare 10% Stock solution of Soda ash, 10 g Soda is mixed with 100 cc water.

Depth of Shade:

0.5% to 5% shade for the goods.

SAMPLE CALCULATION FOR 0.5% SHADE

Sample Calculation for 0.5% Shade:

Sample wt. = 5 mg

Material liquor ratio = 1: 10

Total liquor (5 * 10) = 50 cc

Dye solution required = (5 * 0.5%) / 1% = 2.5 cc

Salt solution required = (50 * 25) / (20 * 10) = 6.25 cc

Soda ash solution required = (50 * 10) / (20 * 10) = 2.5 cc

Water required {50 – (2.5 + 6.25 + 2.5)} = 38.75 cc

Chemical Testing in Lab:

- **Color fastness to washing:**

Test name: BS1006

Procedure:

1) Cut fabric into 100 X 400 mm strips attach to a piece of multi fiber strip the same width and attach along short edge. Make sure all colors are included.

2) Dissolves 4 grams of ECE detergent and 1 gm of sodium per-borate in one liter of distilled water which has been preheated to the required temp of 50^{o}c ± 2^{o}c.

3) Place test pots with the appropriate volume of test solution to give a 50:1 liquor ratio.

4) Scale pots and rotate than for the specified time.

5) When test time is completed, remove the pots from the machine.

6) Remove test pieces from the pots and rinse thoroughly in distilled water, followed by a 10 min rinse in cold running tap water.

7) Squeeze off excess water open out and put on rack to dry.

Color Fastness to Cool Water:

Test name: AATCC 107

- ✓ Test specimen:
- ✓ Sample fabric- 100 mm X 100 mm
- ✓ Multi fiber fabric – 100 X 40 mm
- ✓ Cut the fabric into two pieces.
- ✓ Sandwich the test specimen between two piece of multifibre.

Method:

- The composite specimen is put in a peri dish.
- Water is taken in the dish as required.
- Bubble is made out from the specimen by tapping.
- The specimen is put for 30 min.
- A glass plate is placed on the composite specimen for 15 min at room temperature.
- Excess solution is poured off.
- Peri dish with composite specimen & glass plate is placed into the incubator at (37+/- 2) C for 4 hours.
- The specimen is dried. (Temp 60C)

- **Color fastness to Perspiration Test:**

Test name: ISO E04

(Alkaline condition)

Method:

1) Wet out test specimen and adjacent fabrics thoroughly in an alkaline perspiration solution in room temperature and liquor ratio 50:01 and leave for 30 min.
2) Pour off excess solution without squeezing. Place test specimen between 2 glass plate and acrylic plastic plates.
3) Place test specimen between 2 glass plates or acrylic plastic plates.
4) Place test in incubator for 4 hours at $37^{o}c \pm 2^{o}c$ under a pressure of 12.5 kpa ($5kp/40cm^{2}$).
5) Remove test from incubator hang to dry in warm air at maximum temperature at $60^{o}c$.
6) Assess the change in shade of fabric of the staining of the multifabric strip using light gray scales BS1066 AO2 & AO3

- **Color fastness to rubbing (wet & dry):**

Method:

- At first take a sample of size (14 X 5) cm at wales & course wise.
- Put the crocking cloth on to the finger & stag by finger clip & run 10 times in the 10 seconds manually & assess the crocking cloth with gray scale.
- Place the crocking cloth on the water, it will sucked some water and then squeeze the crocking cloth.

Then place the wet rubbing cloth on to the finger and stag with finger clip and run 10 times in 10 seconds manually. Then assess the crocking cloth by gray scale for wet rubbing. Wet and dry rubbing are checked according to buyer's requirement.

- **Color fastness to light: ISO-** 105 B02

Light Used: Xenon arc lamp

Power to light: 1500 watt

Method:

- Put the sample in the clamp and then put it in the machine. Start running the machine and keep it running for recommended hours of buyer.
- Then take it out and compare with the grey scale of color staining for rating.

AQL:

a. Color fastness to light above 4
b. Color fastness to wash 4-5
c. Color fastness to water 4-5
d. Color fastness to rubbing (wet-4, dry-5)
e. Color fastness to perspiration 4-5

- **pH Test:**

Method:

- Take 2gm sample fabrics and cut into small pieces.
- Then put it conical flax with 100’C water (M:L - 1:50) .
- Then shake it 15 min, then place it in a shaker m/c for 1 hour.
- Then check pH by pH meter.

- **GSM Test:**

Procedure:

GSM is the most important factor. There is a GSM cutter. The sample cut by the GSM cutter is weighted in the electronic balance. The reading (in gm) from the balance is multiplied by 100 to get the value of GSM.

Faults that found in finish fabric by final inspection:

1. Thick and thin place of the yarn
2. Barre effect
3. Hole
4. Miss stitch
5. Starting mark
6. Neps
7. Slubs
8. Dyed fibre
9. Foreign fibre
10. Yarn contamination
11. Oil spot
12. Crease mark
13. Bowing
14. Edge mark
15. Crumple
16. Dirt mark
17. Hairiness
18. Patchy
19. Softener spot
20. Shine mark
21. Color prominence fault
22. Dust
23. Join mark
24. Pin hole

Finished fabric Inspection:

1. Shade check
2. GSM test
3. Width or diameter test

Here also 4 point system is maintained.

Chapter 6

Pretreatment and Dyeing section

Process sequence:

For cotton

Pretreatment (scouring & bleaching) ⇨ Enzyme treatment ⇨ Dyeing ⇨ Soaping

⇩

Softening & Fixing

Specification of different machines:

Bulk Dyeing Section:

Dyeing machine 01.

Type: Sample dyeing machine
Brand name: FONGS
Model No: Allfir 10
Machine Type: High Temperature Machine
Capacity: 1.5 kg
Cycle Time: 03 min
No of Cycle: 12
Winch speed: 250 m/min
No of Nozzle: 1
No of motor: 4

Dyeing machine 02

Type: Sample Dyeing machine
Brand name: FONGS
Model No: Allfir 10
Machine Type: High Temperature Machine
Capacity: 1.5 kg
Cycle Time: 03 min
No of Cycle: 12
Winch speed: 250 m/min
No of Nozzle: 1
No of motor: 2
Design Temp: 140 ° C

Dyeing machine 03

Type: Sample Dyeing machine
Brand name: FONGS
Model No: Allfit 10
Machine Type: High Temperature Machine
Capacity: 2.5 kg
Cycle Time: 03 min
No of Cycle: 12
Winch speed: 250 m/min
No of Nozzle: 1
No of motor: 4

Dyeing machine 04

Type: Jet dyeing machine
Brand name: FONGS
Model No: GN 6-SR-6T
Machine Type: High Temperature Machine
Capacity: 150 kg
Cycle Time: 03 min
No of Cycle: 12
Winch speed: 250 m/min
No of Nozzle: 4
No of motor: 8
Power: 415 v 3 50 Hz
Water supply pressure: 300 Kpa
Compressed Air pressure: 700 Kpa
Steam pressure: 700 Kpa
Design Temp: 140 ° C

Dyeing machine 05

Type: Jet dyeing machine
Brand name: FONGS
Model No: Afflit V60
Machine Type: High Temperature Machine
Capacity: 350 kg
Cycle Time: 03 min
No of Cycle: 12
Winch speed: 250 m/min
No of Nozzle: 4
No of motor: 8
Power: 415 v 3 50 Hz
Water supply pressure: 300 Kpa
Compressed Air pressure: 700 Kpa
Steam pressure: 700 Kpa
Design Temp: 140 ° C

Dyeing machine 06.

Type: Jet Dyeing machine
Brand name: FONGS
Model No: GN 6-SR-6T
Machine Type: High Temperature Machine
Capacity: 1200 kg
Cycle Time: 03 min
No of Cycle: 12
Winch speed: 250 m/min
No of Nozzle: 4
No of motor: 8
Power: 415 v 3 50 Hz
Water supply pressure: 300 Kpa
Compressed Air pressure: 700 Kpa
Steam pressure: 700 Kpa
Design Temp: 140 ° C

Dyeing machine 07

Type: Jet dyeing machine
Brand name: FONGS
Model No: GN 6-SR-6T
Machine Type: High Temperature Machine
Capacity: 1200 kg
Cycle Time: 03 min
No of Cycle: 12
Winch speed: 250 m/min
No of Nozzle: 4
No of motor: 8
Power: 415 v 3 50 Hz
Water supply pressure: 300 Kpa
Compressed Air pressure: 700 Kpa
Steam pressure: 700 Kpa
Design Temp: 140 ° C

Dyeing machine 08

Type: Jet Dyeing machine
Brand name: FONGS
Model No: GN 6-SR-6T
Machine Type: High Temperature Machine
Capacity: 900 kg
Cycle Time: 03 min
No of Cycle: 12
Winch speed: 250 m/min
No of Nozzle: 3
No of motor: 8
Power: 415 v 3 50 Hz
Water supply pressure: 300 Kpa
Compressed Air pressure: 700 Kpa
Steam pressure: 700 Kpa
Design Temp: 140 ° C

Dyeing machine 09

Type: Jet dyeing machine
Brand name: FONGS
Model No: GN 6-SR-6T
Machine Type: High Temperature Machine
Capacity: 900 kg
Cycle Time: 03 min
No of Cycle: 12
Winch speed: 250 m/min
No of Nozzle: 3
No of motor: 8
Power: 415 v 3 50 Hz
Water supply pressure: 300 Kpa
Compressed Air pressure: 700 Kpa
Steam pressure: 700 Kpa
Design Temp: 140 ° C

Dyeing machine 10

Type: Jet dyeing machine
Brand name: FONGS
Model No: GN 6-SR-6T
Machine Type: High Temperature Machine
Capacity: 1200 kg
Cycle Time: 03 min
No of Cycle: 12
Winch speed: 250 m/min
No of Nozzle: 4
No of motor: 8
Power: 415 v 3 50 Hz
Water supply pressure: 300 Kpa
Compressed Air pressure: 700 Kpa
Steam pressure: 700 Kpa
Design Temp: 140 ° C

Dyeing machine 11

Type: Jet dyeing machine
Brand name: FONGS
Model No: GN 6-SR-6T
Machine Type: High Temperature Machine
Capacity: 1200 kg
Cycle Time: 03 min
No of Cycle: 12
Winch speed: 250 m/min
No of Nozzle: 4
No of motor: 8
Power: 415 v 3 50 Hz
Water supply pressure: 300 Kpa
Compressed Air pressure: 700 Kpa
Steam pressure: 700 Kpa
Design Temp: 140 ° C

Dyeing machine 12

Type: Jet dyeing machine
Brand name: FONGS
Model No: GN 6-SR-6T
Machine Type: High Temperature Machine
Capacity: 1200 kg
Cycle Time: 03 min
No of Cycle: 12
Winch speed: 250 m/min
No of Nozzle: 4
No of motor: 8
Power: 415 v 3 50 Hz
Water supply pressure: 300 Kpa
Compressed Air pressure: 700 Kpa
Steam pressure: 700 Kpa
Design Temp: 140 ° C

Dyeing machine 13

Type: Jet dyeing machine
Brand name: FONGS
Model No: GN 6-SR-6T
Machine Type: High Temperature Machine
Capacity: 1200 kg
Cycle Time: 03 min
No of Cycle: 12
Winch speed: 250 m/min
No of Nozzle: 4
No of motor: 8
Power: 415 v 3 50 Hz
Water supply pressure: 300 Kpa
Compressed Air pressure: 700 Kpa
Steam pressure: 700 Kpa
Design Temp: 140 ° C

Main parts of Dyeing Machine:

1. Main Tank
2. Reserve tank
3. Mixing tank
4. Main pump
5. Heat exchanger
6. Filter

The Description of the main parts of the machine is as follows:

Main Tank:

Main tank is the largest part of the dyeing machine. This is the main dye bath which contains the dye liquor & the fabric. The size of the tank depends on the capacity of the machine. Liquor & fabric circulates in the main tank during dyeing process. There may have different number of nozzle connected to main tank according to the machine capacity. Each nozzle may handle 300-900m of fabric.

Reserve Tank:

This tank is mainly used for storage of hot water that will be used for the dyeing process. The temp of water in the tank is maximum 80 C. By using this hot water in the machine during dyeing there is a reduction of time for heating the water in the main tank which result in the reduction of dyeing time.

Photo of Reserve Tank.

Mixing Tank:

This tank is mainly used for storage of hot water that will be used for the dyeing of fabric. The temperature of water in the mixing tank is maximum 80 C. By using this hot water in the machine during dyeing there is a reduction of time for heating the water in the main tank which result in the reduction of total dyeing time.

Photo of Mixing Tank

Heat Exchanger:

During the different stage of dyeing there is a need of increasing or decreasing the temperature of dye liquor gradually. We can not use liquor of required final temperature directly because there may be possibilities of thermal shocking of the fabric. So, the temperature should be increased pr decreased in a controlled manner. This controlling is done by heat exchanger. Actually it is an indirect heater. During the circulation of dye bath liquor, the liquor passes through the heat exchanger.

Photo of heat exchanger

Filter:

During the treatment of fabric in the machines, lots of loose fibre is produced from the fabric. To eliminate these loose fibers, filter is used. It also reduces the loose fibers loads from the fabric. If the loose fibers are not eliminated, then the running of fabric is disturbed & entanglement can not occurred.

Different Types of dyes used in Immaculate with their brand name:

Name of the DYE staff	
Remazol Golden Yellow RGB Remazol Deep Black RGB Remazol Deep Black GWF Gran Remazol Red RGB Gran Remazol Turquoise Blue G133% Remazol Brilliant Blue R Spec Remazol Brilliant Blue BB 133% Gran Remazol Ultra Carmine RGB Remazol Ultra Carmine RGB GR	Germany

Levafix Rubine CA Gran Levafix Red CA Gran Levafix Olive CA Gran Levafix Brillant Red E-4BA Gran Dianix Navy CC Dianix Turquoise S-BG	Germany
Imcozine blue E-NR Imcozine Blue V-CR Imcozine Brilliant Red V-F3B Imcozine Brilliant Yellow V-4GL Imcozine Yellow E-3R 150%	Germany
Bezaktive Blue S-GLD 150 Bezaktive Yellow S-3R 150 Bezaktive Red S-3B 150	Switzerland
Terasil Red W-4BS Terasil Nevy W-RS Novacron Red FN-R-01	Switzerland

Novacron Yellow F-4G	
Starfix Black B 150% Starfix Red EP 150%	China
Sumifix Supra Blue E-XF Sumifix Supra Yellow E-XF	Japan
Sunfix Navy Blue MF-D	Korea

Sequence of Operation for Knit Dyeing:

Grey fabric received from knitting section

⇩

Batching

⇩

Fabric turning

⇩

Loading to the m/c

⇩

Select production program

⇩

Pre-treatment (Scouring & Bleaching)

⇩

Select recipe for Dyeing

⇩

Recipe confirmed by DM/SPO

⇩

Dyeing

⇩

After treatment

⇩

Unload

Pretreatment Program:

Water fill

⇩

Detergent – 1.0 g/l

⇩

Sequestering Agent – 0.6 g/l

⇩

Anticrease – 0.6 g/l

⇩

Fabric load

⇩

Caustic Soda 2.0 g/l

⇩

Peroxide – 2.0 g/l

⇩

Stabilizer – 0.6 g/l

⇩

Temp up 98 c

⇩

98 X 45’

⇩

Cooling at 80 c X drain

⇩

Drain/ fill

⇩

80 X 10’ Normal hot

⇩

Drain/ fill

⇩

Acetic Acid 1.0 g/l + PK 0.8 g/l

⇩

Check PH (4- 4.5)

⇩

Enzyme 0.3%

⇩

55 X 60’

⇩

Temp up 80 c

⇩

Drain/ fill

Production Parameters:

P^H

- During H2O2 bleaching P^H 9.2-12(Alkaline)
- During reactive dyeing P^H 10.5-12.5(Alkaline)
- During disperse dyeing P^H 4.5-6.0 (Acidic)

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: 80-90^0C (For hot brand) 60^0C (For cold brand)
- Polyester dying: 100^0-130^0C

Time:

- For Scouring: 60-90 minutes
- For Disperses dyeing 60-90 minutes**.**

M: L ratio:

- For reactive dyeing M: 1 ratio maintained between 1:6 to 1:10

Polyester Part dyeing:

Acid Injection

⇩

Run time (5 min X 45 C)

⇩

pH check (4.5)

⇩

Color Dosing

⇩

Raise Temp at 130 C

⇩

Run Time 45 min

⇩

Drain

⇩

Normal wash

⇩

Drain

Dyeing sequence for black shade:

Dyeing Sequence for Light Shade:

Process Flow Chart for after treatment:

Water fill

⇩

Normal Hot 70C & run 15 min

⇩

Acetic acid injection

⇩

(check ph 4.5-5)

⇩

Fixing agent dosing 45˚C

⇩

Run time 10 min

⇩

Softener dosing

⇩

Run time 10 min

⇩

Unload

{ If OK then drain, if not OK then addition is given }

Common Dyeing faults:

1. Uneven dyeing
2. Batch to batch shade variation
3. Roll to roll variation
4. Crease mark
5. Dye spot
6. Wrinkle mark
7. Softener mark

Some photos of dyeing section:

Chapter 7

Finishing Section

Machine Description for Finishing Section:

Finishing section is consisting of two lines. They are –

A. Tube line
B. Open line

- The machine that are used for open line are given bellow

- Slitting and Dewatering machine
- Stenter machine
- Compactor machine

- The machines that are used for tube line are given bellow

- Dewatering machine
- Dryer
- Compactor machine

Types of finishing:

- Mechanical

- Calendaring
- Napping
- Brushing
- Shearing
- Tunnel press

- Chemical

- Anti creasing
- Softening
- Stiffing
- Soil release

- Anti static
- Anti bacterial
- Resin finish
- Fiber retardant

Total machine in finishing section:

Machine Name	Number of machine
Slitting machine	01
Dewatering machine	02
Dryer	01
Stenter machine	02
Compacting machine	02

Description of the Machine for Tube Finish:

- **DEWATERING MACHINE: (M/C Specification)**

Brand Name**: Santex Ag**

Company: **Santex Ag**

Origin**: Switzerland**

Max Working Speed**: 80 m/min**

Normal working Speed **: 40 - 60 m/min**

Overfeed Range: **-5% to +10%**

Working principle:

After completing the dyeing process from the dyeing m/c then the fabrics are ready for de-watering. In de-watering m/c tubular fabrics are mainly processed. There is a magnetic sensor which scene the twist of the fabric and its direction and turn the fabric in opposite direction to remove twist automatically. Here dewatering is performed De-watering is the process to remove the water from the fabric completely by squeezing and it is done by the padder. A suitable expander is used before the fabric is passed through the nip of the padders, which expands the fabric flat wise and adjust the width.

The expander width is adjusted as S/J- 20%, PK-25%, Int.-35%, Lacoste-40% wider than the required width. There is a pair of rubber coated padder, where water is removed from fabric when passed through the nip of it. Normally squeezer contain single or double padders where,

- One for removing water and
- Other for applying finishing chemicals such as softener.

But this finishing is done only for the tubular fabric. Open widths knitted fabrics are applied finishing treatment later in stenter.

Here present the compressor which given compress air to form ballooning before passing through the padder. This balloon remove crease mark but not form the maximum balloon otherwise shrinkage increase.

- To control the width (dia) of the fabric.
- To control the spirality of the fabric.
- To control the crease mark of the fabric.
- To control the length of the fabric.

Operational parameter:

Speed: As much as possible (40-60 m/min). Higher the GSM lower the speed.

Over feed: As required. Higher the GSM higher the over feed.

Padder pressure: 3-7 bar as required. Higher the GSM lower the padder pressure.

Width: Fabric width is adjusted as per required width.

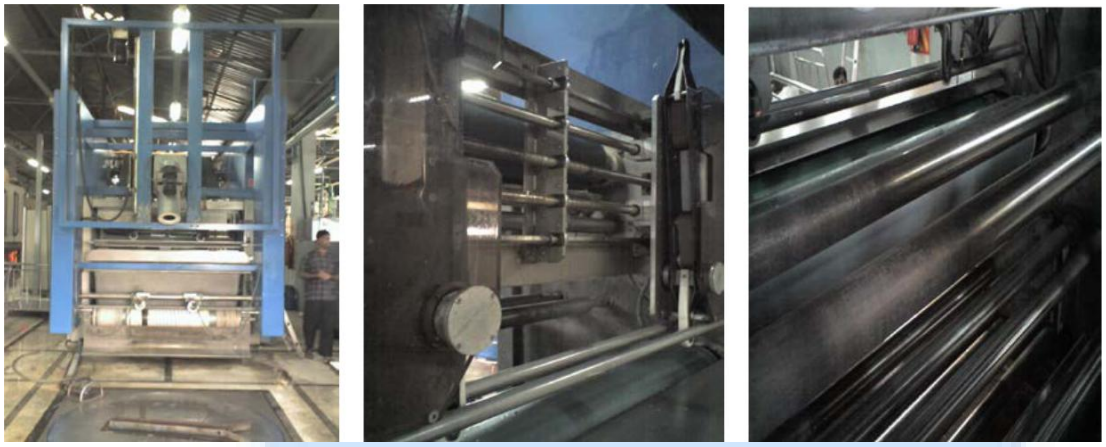


Figure: Dewatering machine

- **DRYER MACHINE: (M/C Specification)**

Brand Name**: Santex ag**

Company: **Santex ag**

Origin: **Switzerland**

Max. Working Speed**: 30 m/min**

Min. working Speed **: 5 - 15 m/min**

Max. Temperature **: 185^{0}C**

No of Burner **: 2**

Working principle of dryer :

After dewatering then the fabric through to the dryer. The main function of the dryer is given below,

- To dry the fabric.
- To control the overfeed system.
- To control the vibration which increase the G.S.M.

This machine contains two chambers. Two mesh endless conveyors are placed lengthwise to the chamber named conveyor net and filter net, each chamber contain a burner, which supply hot air .This hot air is guided through the ducting line by suction fan .There are nozzles placed in between filter net and conveyor net. When the fabric pass on the conveyor net, hot air is supplied to the wet fabric to dry it. There are exhaust fan which such the wet air and deliver to the atmosphere through the ducting line.

The speed of the dryer depends on the temperature of the m/c & the G.S.M of the fabric. If the m/c temp is high then m/c speed also high and the m/c temp is low then m/c speed also low. The vibration speed of the m/c for heavy fabric is 730 m/min and normal fabric is 480 m/min.

The temp of different chambers according to the shade of the fabric –

Shade	**Chamber-1**	**Chamber-2**
Light	120^{0}c	130^{0}c
Medium	135^{0}c	140^{0}c
Deep	150^{0}c	170^{0}c

Figure: Drying Machine

COMPACTOR MACHINE: (M/C Specification)

Brand Name**: Santex ag**

Company: **Santex ag**

Origin: **Switzerland**

Max. Working Speed**: 50 m/min**

Min. working Speed: **5 m/min**

Working Speed: **15~25 m/min**

Max. Temperature: **100^0C~139^0C**

Working principle:-

The main object of compactor is to make the fabric surface smooth, to control the residual shrinkage, G.S.M and if required fabric width also. To control the residual shrinkage the fabric is previously shrinkage artificially by gathering of loops of knitted fabric and it is set by heat and pressure. In tube compactor, the dried tubular knitted fabric is face to steam when it passed through the teflon coated conveyor belt. When a cotton fabric absorbs water, it swells and shrinks (particularly in length direction) because the absorbed water allows the cellulose chains to move relative stain free position. Then the fabric is passed through the expander.This m/c contain two compaction units to compact both side of the tubular fabric. Each unit contains a hot rotating cylinder, blanket which rotate in contact with the cylinder and Teflon cover .while passing the expander roller, the fabric is over feeded. The fabric is compacted with the pressure of blanket and Teflon cover while passing through the hot cylinder .Due to compaction stitch length is reduced. Then the fabric is passed through the counting device .Before packing, the fabric is inspected carefully.

Photo: Compactor machine

SLITTING AND DEWATER MACHINE: (M/C Specification)

Brand Name**: Corino**

Company: **Corino**

Origin: **Italy**

Max capacity**: 8 ton**

Max Speed: **80 m/min**

Normal Working capacity: **6 - 7 ton**

Function of the Machine:

- Used to remove excess water after pretreatment and dyeing.
- To slit the tube fabric by the knife for opening of the fabric and ready for stentering.
- Delivered fabric increase free state.
- Before squeezing balloon is formed with the help of compressed air passing by a nozzle or air sprayer.
- It can control the diameter of fabric and GSM and shrinkage by over feeding mechanism.

Working principle:-

The slitting m/c has 4 units - initial squeezer, de-twisting, slitter and padder. After dyeing completed and falling of water from fabric the fabric is fed in slitting m/c. So it is necessary to remove some water initially for the case of further processing in this m/c. The initial squeezer does this work. The de-twisting unit removes twists that may present in tubular rope form fabric. This unit has 3 de-twisting rollers, one rotation drum and 2 feeler rollers with sensors. By these rollers it detects twist in fabric and removes by rotating rope fabric in opposite direction. Before slitting there is a blower which blows air to open the tubular fabric & makes it easy to pass over cigger. The cigger can be extended in circumference and opens the tubular fabric in full circumference. Slitting is done by using open mark detecting golden eye by around knife. Then the fabric passes through the padder where washing or chemical treatment is done. Squeezer is used to remove 60-70% of water. After removing water width is controlled by stretcher and fabric is delivered by folding device

Photo: Slitting & Dewatering machine

STENTER MACHINE: (M/C Specification)

Brand Name**: Alkan**

Company: **Alkan Makina**

Origin**: Turkey**

Max capacity**: 8 ton/day**

Normal Working capacity: **6 ~7 ton /Day**

No of Burner**: 6 X 2=12**

Min Speed: **10 m/min**

Max Speed: **40 m/min**

Max Temp**: 200 C**

Working Principle:

Stenter Machine is generally used to finish the open fabric. This stenter machine consists of six chambers; each contains two burners, two blowers, two ducting line, nozzles and suction fan attach with the suction line. The burner produces hot flue gases which guided though the ducting line by the help of blower. There are nozzles placed above and below the rail. When the fabric passed through the rail, then hot air is sprayed to the above and bellows the fabric with the help of nozzle. The hot air is circulating in the chamber and the moisture in the fabric is evaporated, which leave the chamber with the help of suction fan through the ducting line. Temperature of each chamber can control automatically by controlling the intensity of burner. Generally lower temperature is maintained the first and last chamber then other chambers.

The speed of the fabric is maintained according to the moisture content of the fabric. After passing the fabrics to all the chambers, the fabric is collected for compaction.

The performance of the stentering range depends on proper introduction of the cloth into the machine. The finer the fabric is being processed, the greater the significance of the correct, crease free and fault free fabric introduction. In stenter m/c the fabric first passed through different rollers including weft straightening device, uncurling device for proper feeding of the fabric into the machine. Then it passed through the selvedge detector which detect the selvedge and adjust the rail for proper gripping the fabric in the pin arrangement. This stenter m/c consists of both pin and clip arrangement. The fabric first grip by pin and gust before entering the chamber, pin are locked by clip arrangement. To maintain proper dimension of the fabric, length wise overfeed and width wise tension is given to the fabric.

Function:

- Drying
- Shrinkage control
- Heat setting
- Width control
- Finishing chemical application.
- Loop control
- Moisture control, etc.

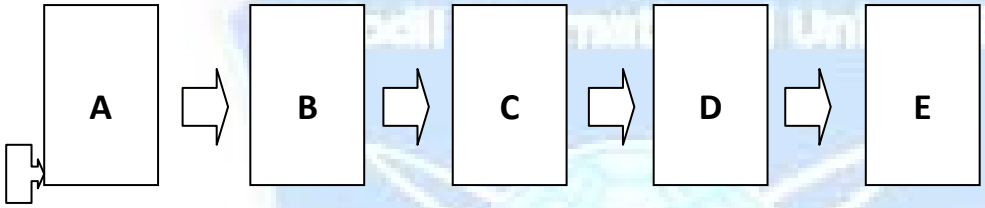
Photo: Stenter Machine

Chapter 8

WTP & ETP

Water Treatment Plant (WPT):

Water for a textile plant may come from various sources. But this water can not be used directly in textile processing because it contains various salts. These salts are mainly the carbonates ($CO3^{2-}$), Hydrogen carbonates or bi-carbonates ($HCO3^{-}$), Sulphates ($SO4^{2-}$) and Chlorides (Cl^{-}) of Calcium (Ca^{2+}), and Magnesium (Mg^{2+}). These are called hardness in the water. These must be removed though water treatment plant.



Where,

A = hard water storage tank
B = Stone filter
C = Carbon filter
D =Resin filter
E =Soft water storage tank
F =Pump

Standard water quantity for dye house

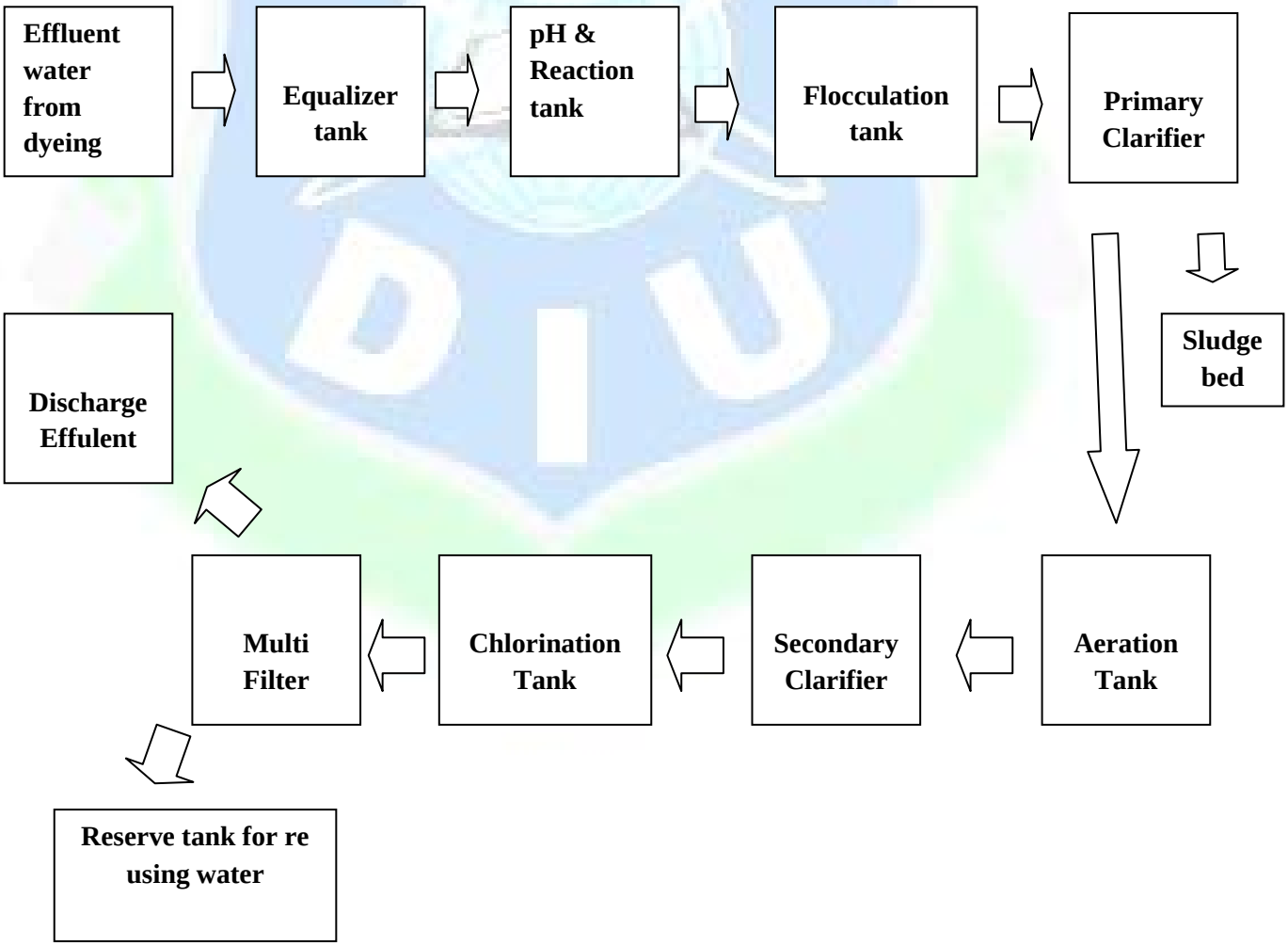
Minimum standard	**Permissible concentration**
Color	Colorless
Smell	No bad smell
Water hardness	< 5
pH value	7-8 neutral
Dissolved solid	< 1 mg/l
Inorganic salt	< 500 g/l
Iron (Fe)	< 0.1 mg/l
Copper	<0.005 mg/l
Nitrate	< 50 mg/l
Nitrite	< 5 mg/l

Hardness check:

The hardness should be checked after every 6 hours. It should be checked by the hardness test kits. The using hardness test kits are Hanna Instrument. Made in Italy. If the hardness is going to be 0.5 on the syring scale. Then have to do the regeneration process. The capacity of the vessed 115 cubic meter per hour or 115 ton/ hour.

ETP

Flow chart of ETP:



Process: Biological

The major sources of liquid discharge are:

- Scouring
- Bleaching
- Dyeing
- Washing

Dye waste content:

Carbon, nitrogen, phosphorus

Bleaching

- Dilute hypochlorite
- Peroxide

Raw materials:

- Main raw material:
- Cotton yarn
- Mixed yarn
- Dyes
- Chemical

Chemical includes:

- Detergent
- Soda ash
- Caustic soda
- Peroxide
- Stabilizer
- Acetic acid

Stepwise function of different unit of ETP:

Equalizer Tank:

Use chemical: Acid solution

Function: To neutralize raw waste water by dozing smaller particle.

pH control Tank:

Use Chemical: Fitcary

Function: To control pH

Reaction Tank:

Use chemical: Lime

Function: To agglomerate smaller particle

Flocculation Tank:

Use Chemicals: Polylectrolyte & alum

Function: To produce flock

Primary Clarifier:

Function: To monitor performance of flocculation clarifier & separate solid waste.

Sludge bed:

Function: Solid waste dried & send to outside for burial.

Aeration tank:

Use chemical: Bacteria, Urea, Cow dung.

Function: Bio logical oxygen demand & Chemical oxygen demand reduce here & diffused system ensures high oxidation efficiency.

Secondary Tank:

Function: Remaining solid waste separate here. Reduce total solid.

Chlorination Tank:

Used Chemicals: Sodium hypochloride

Function: Disinfection done here

Multi filter:

Function: Extra suspended impurities separation by passing into the sand. Here removed suspended solution and correction the water color.

Chapter 8

Utilities

Introduction:

The Immaculate Textile Ltd is a big project and so of course having a vast project of utility service. Here the total account of utility facilities is available. The utilities are

a) Water
b) Gas
c) Electricity
d) Compressed Air
e) Steam.

Water treatment plant:

(Water Softening Method – Base Exchange Process)

- Source of water is deep tube well.
- Production capacity – 80 m^3 /hr = 1920000 liter/day
- Actual Production – 1500000 liter/day
- Required water - 1300000 liter/day

ELECTRICITY

Gas Generator is used for supplying electricity for the Production & office of the Immaculate Textile Ltd.

- Total power produced by Gas Generator – 945 KW = 1134 KVA
- Factory (Dyeing & Knitting) Power Needed for Installation – About 1200 KW
- Factory (Dyeing & Knitting) Power needed at running stage – About 720 KW Power Needed for Office – About 250 KW

COMPRESSED AIR

Compressed air is produced by air compressor.There are two air compressors for producing compressed air.

Specification of the air compressor is given below:

Technical Details	Air Compressor
Type	Atlas Copco
Manufacturer	Atlas Copco airpower
Model No	GA 30
Country	Belgium
Maximum Working Pressure	10 bar
Free air delivery	78 lit per sec
Nominal shaft power	30 KW
Rotational shaft speed	3000 rpm
Gross weight	995 Kg

STEAM

Steam is produce by Boiler.

From the Water Treatment Plant, water is stored in a reserve tank and from there water goes to boiler & steam is produced.

Technical Details	Boiler Data
Type	Fire Tube Boiler
Manufacturer	OMNICAL BORSIG ENERGY
Model No	DDHI 60 – 10
Country	Germany
Thermal Capacity	3.9 MW
Maximum steal out	6 ton/hour
Maximum working pressure	10 bar

GAS:

The source of Gas is TITAS GAS LTD.

The gas is supplied to gas generator or different section (Boiler- for heating water) from the main line of the TITAS GAS LTD.

Chapter 9

CONCLUSION:

First of all we want to give the thanks to ALLAH for successfully completed our industrial attachment. Actually The Immaculate Textile Ltd is a 100% export oriented composite Textile Industries. During the training period we completed our industrial attachment to a systematic routine which was provided by factory. we got help from different section officers and workers which was helpful to gain a very good practical knowledge. Sometimes we operate machine for various jobs during operation. Last of all we are giving thanks all the off icer and workers who helped a lot by co-operating and giving reliable information.