COLLECTORATE OF SALES TAX & CENTRAL EXCISE LAHORE

TEXTILE INDUSTRY NOTES

TEXTILE
INDUSTRY NOTES

Produced by	The Office of Chief CBR (Textile Sector)
In consultation with	The National College of Textile Engineering Respective Associations
Published by	Common Pool Fund Collectorate of Sales Tax & Central Excise, Lahore

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FOREWORD

The self-assessment system introduced in 1996 in the sales tax administration, has brought fundamental changes in the style and operations of the department. As physical and interventionist control mechanisms gave way to periodic audits, the need to develop well-researched audit manuals has become increasingly manifest. The importance of developing technically sound industry notes to back-up audit efforts has always been felt. Textile sector, the biggest economic reality of the country, was selected as the first area for development of comprehensive industry notes.

This compilation is the outcome of immense work done by Mr. M. Ashraf Khan in close coordination with the National College of Textile Engineering, Faisalabad. Contents of the study were elaborately discussed at various fora with a number of representative associations of textile sector and the departmental officers to include their input. Miscellaneous information regarding sales tax related matters and audit guidelines have also been added.

I sincerely hope that this work will be of significant professional use for the departmental officers. The creative effort of Mr. Muhammad Ashraf Khan, Chief, Sales Tax (Textile Sector) richly deserves applaud.

October, 2002

(Riaz Ahmad Malik)
Secretary Revenue Division
& Chairman CBR

PREFACE

The VAT mode Sales Tax introduced in the country in 1996, basically a universal self-assessment system, promotes voluntary compliance while providing control mechanism through audit. The audit effort, however, need to be well defined, structured and adequately supported with such tools as technically sound industry notes. The sector notes contained in the Audit Handbook circulated by the Sales Tax Wing of Central Board of Revenue in 1996 were of general nature. Conspicuous by absence were the production parameters and input-output ratios. The Task Force on Reform of Tax Administration had, therefore, rightly stressed the urgent need to develop adequate industry notes.

2. Textile is one of the most important areas with regard to Sales Tax revenue and refund. However, in the absence of reliable and comprehensive industry notes regarding various sub sectors of this very vital manufacturing activity, audit support has been inadequate. Consequently, issues concerning this industry have also not been appropriately handled.

3. In compliance with the directions of the Central Board of Revenue, the matter of developing industry notes relating to textile was taken up with the National College of Textile Engineering, Faisalabad. The College, a recognized professional institution, was required to prepare notes on ginning, spinning, weaving, processing, knitting and stitching sectors covering the following aspects, essentially relating to production: -

i. Type of machinery used in each process
ii. Categories of raw material being used
iii. Systems and stages of manufacturing/processing
iv. The input/output ratios
v. Element of value addition at each stage
vi. Ranges of wastages of each stage of manufacturing
vii. Co-relation of energy vis-à-vis production

4. After carrying out necessary exercise, the College submitted its report which was duly circulated to the following Associations of the manufacturers of different textile products for their views:

(a) All Pakistan Textile Mills Association
(b) Pakistan Open End Spinners Association
(c) Pakistan Cotton Ginners Association
(d) All Pakistan Cotton Power Looms Association
(e) All Pakistan Sizing Association
(f) All Pakistan Textile Processing Mills Association
(g) Pakistan Hosiery Manufacturers Association
(h) Pakistan Readymade Garments Manufacturers and Exporters Association
(i) Pakistan Canvas & Tents Manufacturers & Exporters Association
(j) Towel Manufacturers' Association of Pakistan

5. All of the above Associations have validated the notes relating to them except (i) All Pakistan Textile Processing Mills Association who contend that there is no need of these notes in the presence of record related agreed audit parameters and (ii) All Pakistan Sizing Association who did not respond despite reminders. Letters from each Association issued to this effect are included in this study. Besides input from the Sales Tax Collectorates, these notes also include relevant information/data gathered from the publications of Textile Commissioner's Organization, APTMA, Federal Bureau of Statistics, SMEDA and Input Output Co-efficient Organization (IOCO).

6. This compilation has been essentially designed to enhance manufacturing related understanding of the departmental officials and as such it has no reference to factors that may emanate out of financial or accounting record. While avoiding use of technical jargon, effort has been made to use simple and direct manner to provide all relevant information about machinery and manufacturing processes in ginning, spinning, weaving, processing, knitting, stitching, tent and towel manufacturing

sectors; production parameters are generally formulae based and input output ratios indicate the types of raw materials used, percentage yields and ranges of wastages. Moreover, issues relating to sales tax in each sector have been highlighted and duly supplemented by audit guidelines to cover the revenue risk areas. List of paragraphs and tables are given in the beginning of each chapter for ease of reference. Summary of important information is appended at the end of each chapter to make the essential information handy to the users. Data relating to potential and production of textile industry is available in Appendix-I. Moreover, definitions to common textile terms are given in Appendix-II for convenience of the users.

7. Since most of the aforesaid Associations of textile industry have validated the production related information as contained in this book, these notes may be termed as parameters agreed by them. However, these notes are subject to modification after due consultation with the stakeholders (CBR and Associations) if any specific information is found factually incorrect. The contents of this compilation are expected to enrich the professional capabilities of the departmental officers and staff for developing targeted and risk based audit approach.

8. These Sector Notes have been completed with invaluable assistance provided by M/s Najeeb Qadir, Raza Ashfaq and Nauman Afzal of this office. Support and cooperation received for this study from the Chairman and Member (Sales Tax) Central Board of Revenue, the aforesaid Associations of textile industry and faculty of National College of Textile Engineering is thankfully acknowledged.

October, 2002

(Muhammad Ashraf Khan)
Chief, Sales Tax (Textile Sector)
Central Board of Revenue

NATIONAL COLLEGE OF TEXTILE ENGINEERING FAISALABAD

No.CTE/SG-38/2002-09

Dated: 5th July, 2002.

Mr. Muhammad Ashraf Khan,
Chief Sales Tax (Textile Sector),
Central Board of Revenue,
Custom House, Nabha Road,
Lahore.

Subject.- **SECTOR NOTES.**

Please refer to the correspondence resting with CBR on the above subject.

2. National College of Textile Engineering Faisalabad, has completed the study on ginning, weaving, processing, knitting and stitching sectors of textile industry keeping in view the requirements of CBR. A copy of this study is enclosed.

3. Besides utilizing the in-house professional and technical expertise, the College has also carried out physical survey of certain manufacturing processes to accomplish this exercise. Series of meetings held with the Chief (Textile Sector) and his officers as well as the experts from the industry have helped a lot in making this exercise a useful venture for the department.

National College of Textile Engineering Faisalabad

(Dr. Abdul Majeed)
Principal

Encl: as above

Tel: 92-41-753741, 753743, 753744 Fax: 92-41-751714 E.Mail:ntu@fsd.paknet.com.pk

بسم اللہ الرحمٰن الرحیم

PAKISTAN COTTON GINNERS' ASSOCIATION

PCGA
Recognised as Class "A"
by the Govt. of Pakistan

Ref. No. 284/S.Tax/PC
Date 03/08/2002

764
7/8/02

To,

Mr. Muhammad Ashraf Khan
Chief Sales Tax (Textile Sector),
Custom House, **Lahore.**

SUBJECT:- **INDUSTRY NOTES (GINNING SECTOR).**

Industry Notes relating to Ginning Sector prepared by the office of Chief Sales Tax (Textile Sector) in consultation with the National College of Textile Engineering, Fasisabad have been examined. These notes give correct information relating to working of ginneries, production process and machinery used in ginning production formulas from raw cotton and cotton seed. The Association subscribes to these notes.

(Abul Rasheed Khan)
(Chairman)

PCGA HOUSE, M.D.A. Road, Multan. Tel. Office : 549815-16 Fax : 549817
Head Office: 1119-1120, 11th Floor, Uni Plaza, I.I. Chundrigar Road, Karachi.
PHONE: (021) 2411406, 2411882 FAX: 2423181
E-Mail: pcga@mul.paknet.com.pk

aptma
all pakistan textile mills association
(punjab zone)
97-A, AZIZ AVENUE CANAL BANK OFF GULBERG ROAD, LAHORE.
PHONES: 5754345-48, UAN - 111 700 000, FAX : 5754341 GRAMS: APTMA
e-mail: aptma@brain.net.pk

PZ/L&T/GST/02-465

September 03, 2002
By Courier

Mr. M. Ashraf Khan
Chief Sales Tax (Textile)
Custom House, Nabha Road,
Lahore.

310
05-09-2002
10.15 AM

REPORT ON SPINNING INDUSTRY

Dear Sir(s)

We are pleased to acknowledge with thanks the receipt of copy of the report on spinning industry. We have gone through and found technical part of the report useful guide for officers to understand various processes of the textile Industry. We appreciate efforts put in by the department in compilation of the industry notes.

In respect of marketing part of the report, we cannot comment on various statistics given in the report. In the report price averages and wastages have been mentioned which would have no meaning in view of their dependence on a number of variables.

With regards,

Yours truly,

(Anis-ul-Haq)
Secretary

c.c. *Chairman*

PAKISTAN OPEN END SPINNERS ASSOCIATION

Principal Office:
Suit No. 18, 4th Floor Shan Arcade Civic Center, New Garden Town, Lahore. Ph: 042-5831381

October 15, 2002

Mr. Muhammad Ashraf Khan.
1st Floor, Customs House,
Lahore.

Subject: INDUSTRY NOTES OPEN - END WASTE YARN

Dear Sir,

Industry Notes relating to Open End Waste Yarn prepared by the Office of Chief Sales Tax (Textile Sector) in consultation with the Pakistan Open End Spinners Association have been examined. These notes give correct information relating to working of this manufacturing industry, production process, wastages and machinery used in this sector. The Association subscribes to these notes.

M. Ashraf Mehmood
Vice Chairman

ALL PAKISTAN COTTON
POWER LOOMS ASSOCIATION

آل پاکستان کاٹن پاورلومز ایسوسی ایشن

HEAD OFF: P-107, ST.NO.5, 1ST FLOOR, MONTGOMERY BAZAR, FAISALABAD. PH:612929 - 639383 FAX: 613636

REF. NO. CM/22/154/02 DATED 03-08-2002

Mr. Muhammad Ashraf Khan.
Chief Sales Tax (Textile Sector).
Custom House, Lahore.

Subject: INDUSTRY NOTES (WEAVING SECTOR).

Industry Notes relating to Weaving Sectors prepared by the office of Chief Sales Tax (Textile Sector) in consultation with the National College of Textile Engineering, Faisalabad have been examined. These notes give correct information relating to production process and machinery used in weaving, production formulas, production capacities of different types of looms, wastage ratios and other issues relating to weaving. The Association subscribes to these notes.

Abdul Haq

Chaudry Abdul Haq.
Chairman.

ALL PAKISTAN TEXTILE PROCESSING MILLS ASSOCIATION

287
29-08-2002
10.30 A.M

Dated: 28[th] August 2002
Ref.No.APTPMA/CST/2002-2003/141
(By Fax/Courier/E-mail)

Mr.Muhammad Ashraf Khan,
Chief (Textile Sector) CBR,
Sales Tax Wing (Textile Sector)
Custom House, Nabha Road,
LAHORE

Subject: SECTOR NOTES

Dear Sir,

I have been directed by Mr.Bashir Mahmood, Chairman All Pakistan Textile Processing Mills Association (APTPMA), to acknowledge your letter C.No.I/C(TS)7/2001/3433 dated 08.08.2002 on the above subject, and your telephone call this morning.

Sales Tax Audit Parameters, which were prepared by FPCCI Audit Parameters Standing Committee chaired by Mr.G.R.Arshad after a series of meetings, have already been finalized by CBR. These have been duly notified by Secretary ST-Audit vide his C.No.5(49)ST-Int.Audit/2001 dated 17[th] November 2001. As such, there appears to be no need for any further amendment or improvement therein. Kindly note.

A copy of C.No.5(49)/ST-Int.Audit/2001 dated 17[th] November 2001, is being enclosed herewith for ready reference.

Thanking you,

Yours faithfully,

Iqbal

(ZAHIR IQBAL KHAWJA)
Secretary

C.C: 1. Mr.Bashir Mahmood, Chairman APTPMA, Gujranwala
2. Mr.G.R.Arshad, Chairman Committee on Sales Tax Audit Parameters FPCCI, Karachi and Chairman Action Committee APTPMA.

Head Office: 213-Main Soosan Road, 1st Floor, Ibrahim Plaza, Madina Town, Near The Bank of Punjab, Faisalabad(Pakistan)
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PRGMEA

PAKISTAN READYMADE GARMENTS MANUFACTURERS & EXPORTERS ASSOCIATION

Zonal Office:
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Recognised by Govt. Of Pakistan www.prgmea.org

Ref:CBR SALES-T-C02 20 July 2002

Mr. Muhammad Ashraf Khan.
Chief Sales Tax Wing,
(Textile Sector).
Custom House. Nabha Road.
Lahore.
FAX # 9211166-9211165
TEL # 9210509

Subject: Sales Tax Refund Cases.

Dear Sir.

In a meeting of the Zonal Managing Committee presided over by Mr. Jawwad A. Chaudhry. the following minimum wastages in the majority of the value added textile products groups such as:

> infants dresses, sports-wear, martial arts, judo karate; trousers/shorts, blouses/skirts, shirts etc. other miscellaneous wearing apparels, working garments , under garments, T-Shirts, Socks, Traditional dresses, Casual wear etc.

were thoroughly considered, discussed and determined as minimum wastage in the shipment being made at:

(a) Cutting Stage	(14%)
(b) Stitching //	(2%)
(c) Rejection on inspection	(3%)
(d) "B" Grade portion	(1%)

iii) Factors affecting rejection %

1. Bad quality of fabric.
2. Mixing in Chemicals for washing.
3. Abrupt electricity breakdown which continues occasionally for hours which fade colours and damage the export consignment.

A copy of the circular letter which was sent to our member firms and the percentages indicated above agreed to in the Committee meeting is also attached.

Thanking you.

Best regards.

Secretary

U.M.S

GOVERNMENT OF PAKITAN
CENTRAL BAORD OF REVENUE
SALES TAX WING (TEXTILE SECTOR)
CUSTOM HOSE NABHA ROAD LAHORE

C. No. I/C(TS)7/202/3789 Dated:29-08-2002

Mr. Zahir Iqbal Khawja,
Secretary,
All Pakistan Textile Processing Mill Association,
213-Mian Soosan Road, 1st Floor, Ibrahim Plaza,
Madina Town, Faisalabad.

SUBJECT **SECTOR NOTES**

Please refer to the Association's letter No.APTMA/CST/2002-2003/141 dated 28.08.2002 on the above subject.

2 It is to inform that the audit parameters issued by CBR vide letter No. 5(49)ST-Int.Audit/2001 dated 17th November 2001 pertain to the records which are generally to be examined during the audit of registered persons These parameters have no relevance to the manufacturing process of various sectors The sector notes forwarded by this office cover machinery and manufacturing process in textile processing , production parameters, input output ratios and average wastage percentages etc. . Hence the aforesaid audit parameters are entirely different from the sector notes which essentially relate to manufacturing side.

3. As such views of the Association are required on these sector notes independent of the earlier audit parameters. In case no response is received by 31..08.2002., it will be presumed that the Association subscribes to these notes developed by the National College of Textile Engineering, Faisalabad

29/8

(MHUAMMAD ASHRAF KHAN)
CHIEF (TEXTILE SECTOR)

Copy to :-

1. Member (Sales Tax) Central Board of Revenue, Islamabad with reference to telephonic instructions dated 28.08.2002 .

29/8

(MHUAMMAD ASHRAF KHAN)
CHIEF (TEXTILE SECTOR)

Time 3:30.

333
14-09-2002

PAKISTAN HOSIERY MANUFACTURERS ASSOCIATION

(GOVT. APPROVED SOLE REPRESENTATIVE BODY OF HOSIERY INDUSTRY)

Chairman's Office:
PHMA House, 33-D,
New Muslim Town,
Lahore.
Tel: 5833868, 5830694
Fax: 5832213

Ref: *PHMA/20.01/1491*
Date: *September 14, 2002*

Mr. Muhammad Ashraf Khan,
Chief (Textile Sector),
Sales Tax Wing (Textile Sector),
Custom House, Nabha Road,
Lahore.

Sub: **SECTOR NOTES ON KNITWEAR**

Dear Sir,

1. Please refer to your letter No. I/C(TS)/2001/3456 dated 12.08.2002 on the above subject asking for Pakistan Hosiery Manufacturers Association's (PHMA) comments on Sector Notes on knitting prepared by the National College of Textile Engineering, Faisalabad.

2. On consideration of these notes, the PHMA had certain reservations about the element of wastages included therein. As per our request vide letter PHMA/20.01/1417 dated 21-08-02 a team consisting of the representative of the PHMA and your office has physically surveyed the manufacturing process of M/s Comfort Knitwear (Pvt) Ltd. and M/s Akbar Enterprises, both situated at Lahore.

3. A meeting was held in your office on 12-09-02 to finalize the report of the team on wastage of knitting industry in which PHMA was represented by Mr. Shahzad Azam Khan, Chairman and Mr. M. I. Khurram. After detailed discussion on the physical survey data, the following was unanimously agreed:-

	Description	Average wastage
a)	Units not using dyed yarn for their production	35%
b)	Units using both un-dyed and dyed yarn for their production.	40%
c)	Units using entirely dyed yarn for their production.	45%

Note: These wastage percentages include each and every type of manufacturing process employed in the knitting industry but does not include 1-3% garment rejection as B or C grade.

You are requested to incorporate the agreed points in your working.

Thanking you.

Yours sincerely,

SHAHZAD AZAM KHAN
Chairman

Pakistan Canvas and Tents Manufacturers and Exporters Association (Regd.)

PCTMEA

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Abdul Razzak Chhapra
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Ref PCTMEA-HO/2002/13844.

Dated: September 26, 2002

Mr. Muhammad Ashraf Khan,
Chief Sales Tax (Textile Sector),
1st Floor, Customs House,
Nabha Road,
Lahore.

Subject INDUSTRY NOTES (TENT SECTOR).

Dear Sir

Industry Notes relating to Tent Sector prepared by the Office of Chief Sales Tax (Textile Sector) in consultation with the Pakistan Canvas and Tents Manufacturers & Exporters Association have been examined. These notes give correct information relating to working of this tent manufacturing industry, production process, wastages and machinery used in this sector. The Association subscribes to these notes

(MUMTAZ H. SUBZWARI)
VICE CHAIRMAN.
Pakistan Canvas & Tents Manufacturers
& Exporters Association.

Towel Manufacturers' Association of Pakistan
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77-A S.M.C.H.S Karachi-74400 (Pakistan)
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No.1258/TMA May 27. 2003

Mr. Muhammad Ashraf Khan
Chief, Sales Tax, (Textile/BPR)
Custom House
Nabha Road
Lahore

INDUSTRY NOTES (TOWEL MANUFACTURING SECTOR)

Dear Sir,

1. Industry Notes relating to Towel Manufacturing Sector prepared by Chief, Sales Tax, (Textile/BPR) in coordination with the Collectorate of Sales Tax (East), Karachi and Towel Manufacturers' Association of Pakistan has been examined. These Notes give correct information relating to towel manufacturing process, production parameter, value addition, input output ratios and wastage ratios etc.

2. The following amendments which have already been made by us on page No.9 be made in the report::

NOTES ON STAGE-WISE WASTAGE CHAPTER 7.7 REFERS

a) If sheering process is used, add another 20% wastage.
b) B grade is 5 to 30% of A grade to Rs.25/= per kg.
c) B grade is sold between Rs.20/= to Rs.25/= per kg.
d) Wastage of cutting is used for preparation of rags etc.
e) Rags are sold between Rs.10/= to Rs.15/= per kg.

3. The Associationn subscribes to these Notes.

Thanking you,

Yours faithfully,

(M. Muzammil Hussain)
Vice Chairman

Chapter 1

GINNING

List of Paragraphs

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Chapter 1

GINNING

1.1 Introduction

1.1.1 Natural fibers contribute about 52% of the total world textile fiber production. Among the natural fibers, about 90% are of vegetable origin, amongst them cotton constitutes around 80%. Cotton is grown in about 80 countries and 70 of them are in the third world.

1.1.2 Raw material represents about two-third of production cost of short staple fiber yarn. This fact alone is sufficient to indicate the significance of the raw material for the yarn producer. Ginning industry provides the raw material for short staple spinning industry. So ginning industry is the fundamental section of textile industry.

1.1.3 Ginning is the name given to the process (after picking the seed cotton), which performs the primary function of separating the lint from the cotton seed. The secondary functions are cleaning of lint and converting its loose form into a compact bale.

1.1.4 Seed cotton commonly known as Phutty/Kappas, serves as raw material for ginning industry. Phutty/Kappas is purchased by the ginners from the growers/farmers through a wide network of middlemen called Aarhtees/traders who normally purchase Phutty. Maund (37.3245 KG) is the normal unit of weight for the purposes of value of phutti/kappas and lint cotton.

1.1.5 The normal weight of cotton bale is 170 Kg (4.554 Maund): A large number of ginning factories are taken on lease, besides self ginning by the owners. Cotton fee/ cess of the provincial government @ Paisa 10/ Kg is leviable on raw cotton (phutti) whereas 15% Sales Tax and 1% fixed Income Tax are payable on the value of ginned cotton. Besides Sales Tax record, prescribed under Section 22 of the Sales Tax Act 1990, other record like Phutti arrival register, ginning register, baling register, weighment book and dispatch register are also required to be maintained under the Cotton Control Rules 1966 of the Provincial Government. Pakistan Cotton Ginners Association (PCGA) is the representative body of the ginners, which also compiles data relating to production and supply of cotton. The Provincial Agriculture Department, Ministry of Agriculture, Central Cotton Research Institute Multan, Karachi Cotton Association, Central Cotton Committee and Federal Bureau of Statistics have their role in conducting survey and assessing the ex-farm production of phutti and lint cotton in bales.

1.2 Area of Cotton

About 78% of cotton is produced in the Punjab and 22% in the Sindh. Cotton is also now being grown in Pat Feeder area of Baluchistan. Cotton crop is grown in the following districts:

Table 1.1

S.No.	Punjab	Sindh
	Name of Districts.	Name of Districts.
1	Multan	Hyderabad
2	Lodhran	Tharparkar
3	Khanewal	Sanghar
4	Muzaffargahr	Nawab shah
5	Dera Ghazi Khan	Naushero Feroze
6	Rajanpur	Khairpur
7	Layya	Ghotki
8	Vehari	Sukkur
9	Sahiwal	Dadu

10	Pakpattan	Umer kot
11	Okara	Mir pur khas
12	Kasur	
13	T.T.Singh	
14	Faisalabad	
15	Jhang	
16	Mianwali	
17	Bhakkar	
18	Rahim Yar Khan	
19	Bahawalpur	
20	Bahawalnagar	

1.3 Ginning Season

Table 1.2

Duration	Area
15 August to January.	Lower Sindh (Mirpurkhas, Hyderabad, Digri, Mirwah etc)
September to 15 January	Punjab (CheechaWatani, Mianwali, Sahiwal).
15 October 15 January	Upper Sindh and Lower Punjab (Daharki,Ghotki, Sadiqabad, Rahim Yar Khan, Mian Chanoo, Multan, Bhawal Nagar, D.G Khan, Muzaffar Garh, Rajanpur, Khanewal, Lodhran etc.)

1.3.1 Picking Related Features

Generally there are three pickings of Phutti from the farms, amongst them, the quality of second picking having greater share of yield, is considered to be the best one.

1.3.1.1 First picking

In the first time picking phutti has following features.

- High Moisture
- High Shortage
- High MIC
- Low GOT (Gross Out Turn)
- Low Trash

All of these elements result in a high consumption of electricity.

1.3.1.2 Second Picking

During second picking phutti has following features and has a high yield with low consumption of electricity.

- Low Moisture
- Minimum Trash
- High GOT

1.3.1.3 Third Picking

Third packing has the following features and it has higher percentage of trash consumption.

- Low Moisture
- Low MIC
- High Trash

1.4 Sales Tax Registration and Revenue

1.4.1 Registered ginning factories

Table 1.3 (Registration)

(2000-2001)

Name of Collectorate	Registered	Operational
Multan	1326	1272
Hyderabad	239	211
Faisalbad	129	106
Lahore	44	33
Total	1734	1622

Source: Sales Tax Computer wing, CBR.

1.4.1 Sales Tax Revenue from Ginned Cotton.

The amount of sales tax on supply of lint-cotton @ Rs.1700/- maund (37.324 kg) and bale weight of 170 kg works out to Rs.1161 per bale. This amount increases by Rs. 68/bale on every increase of Rs. 100/maud in the price of lint cotton. Following are the figures of sales tax collection from ginned cotton during last four years.

Table 1.3 (Revenue)

(2000-2001) **(Rs. in million)**

Year	Collection
1998-99	9165.447
1999-2000	10636.173
2000-2001	12624.000
2001-2002	10629.325

Source: Sales Tax Computer wing, CBR.

1.5. Layout of Ginning Factory

The ginning process has undergone a high degree of automation. Nowadays, all operations such as feeding, drying, pre-cleaning, lint-cleaning, and pressing form successive continuous stages of a single integrated system. No manual handling of material is involved at any stage of processing. The entire processing system from seed cotton to baled cotton is usually controlled electronically from a central console. Additional workers are required only for supervision, bale transportation and maintenance. Conveyance of material from one machine to another in the above system is by pneumatic means through a series of pipes. Seed cotton is picked up from the storage module by a powerful suction arrangement and fed to a tower drier through a feed-control arrangement which regulates the amount of seed cotton fed in. From the pre-cleaning machines, the seed cotton passes on to the feed regulators located on top of each gin. These control units feed seed cotton uniformly at condenser, which separates the fibers from the conveying air stream and forms them into a thick sheet of cotton, which is then fed to the first of a set of two lint cleaners.

Cotton emerging from the lint cleaner is fed to the baling press box. The amount of pre-ginning and post-ginning equipment depends on the seed-cotton characteristics, such as moisture content and trash. When processing some types of cotton, some machines may be rendered unnecessary. Hence, to ensure flexibility while processing different types of cotton, bypass arrangements are usually provided.

1.6. Packing Material

1.6.1 Hessian cloth (made from Jute). Usually nine threads per inch are used to manufacture Hessian cloth as compared to 13 threads per inch for Jute bags. Per bale consumption of Hessian cloth is around three meters of four-side cover of bale and around 3.5 meters for six-side cover of bale.

1.6.2 Bailing hoops made from steel or plastic strips commonly known as patri are also used for binding the bale. Bailing hoops of steel are used @ 2 to 2.25 Kgs. per bale.

1.7. Lint Cotton

In ginning industry, a quantity of 100 bales is termed as one "lot". Quantity produced or sold/supplied is counted by the ginners, in lots. Lots so produced are always serially numbered. 10.6 million bales have been produced during 2001-2002. Sale and purchase of lint cotton is done through middlemen called broker who play this role on payment of nominal fee which is charged @ Rs. 0.35 to Rs. 0.50 per value of Rs. 100 from the supplier and upto Rs. 0.25 per transaction of Rs. 100 from the buyer/textile mills. However, the rate of lint cotton is subject to the approval of supply by the spinning unit. Spinning Mills, Karachi Cotton Association and Trading Corporation of Pakistan are the buyers of cotton from the ginners.

1.8 Input Output Ratio in the Ginning Sector

Recovery of lint cotton from phutti depends upon a number of factors like area, season, picking time and storage made etc. However, average recovery is estimated as under with slight $\pm$.

Table 1.4

Particulars		**Out put**	
Ginning Sector			
Input / Out put Ratio from Phutti	**Lint Cotton**	**Cotton Seed**	**Wastage**
	33% to 34%	58% to 59%	9% to 7%
Oil Mill Section	**Oil Cake**	**Oil**	**Oil Dirt**
Input / Output ratio from cotton Seed	82% to 85%	10% to 12%	8% to 3%

Source: Pakistan Cotton Ginners Association

1.9. Energy Consumption in Ginning

Mainly the ginning factories run on electricity. However, some factories also use disel oil for power generation. The consumption of electricity depends upon the type/age of machinery, content of trash and humidity in the phutti. More electricity is required for ginning the phutti having higher content of trash. According to PCGA the average of Sind ginning factories is 20-22 units of electricity per bale while it is 20-24 units in Punjab because there is only one electricity meter in Punjab factories which supplies power to machinery as well as offices. After carrying physical survey of different ginning factories in different Collectorates, the CBR has advised the Collectorates to take 18-20 units of electricity consumption for manufacturing one bale of cotton of standard weight. Average diesel oil consumption (instead of electricity) is normally : 5-6 liters/bale.

1.9.1 Cotton Seed

Cotton seed is used by oil expelling units or solvent plants for extraction of oil. A large number of the ginning factories have their own expellers installed within factory premises which consume/crush major portion of cotton seed produced during ginning process for the purpose of oil extraction. Rest of the cotton seed is sold to oil mills or the solvent plants. A smaller portion of its total production is also used for sowing purpose as seed by growers/farmers for the next cotton crop. Cotton seed oil serves as raw material for the manufacture of banaspati ghee or cooking oil. In the process of oil extraction through oil expellers two products, namely, oil cake and oil are produced. Electricity consumption in crushing of one mound cotton seed ranges from 2.5 to 3 units. Oil cake is used as animal feed whereas, oil dirt is used for the manufacture of soap-stock. Cotton seed, oil dirt, seed oil, and oil cake are currently exempt from Sales Tax.

1.10. Machinery Used For Crushing Cotton Seed

Electrically powered expellers are used for crushing of cotton seed. In Punjab these are manufactured in Vehari, Burewala, Mian Chunnu and Multan and are marketed in three different varieties, viz, standard, Jumbo and automatic (latest). Their crushing capacity on the basis of three shifts i.e. 24 hours is as under:

Type	Crushing Capacity
Standard	7.2 to 7.6 Metric Ton
Jumbo	12 to 14 Metric Ton
Automatic	8.4 to 8.8 Metric Ton

1.11. Non Reported/Declared Portion of Cotton

Total ex-farm production of cotton is not reported in bales by PCGA. Ex-farm cotton equal to around 5% of total production does not reach the ginning factories and is consumed by the farmers' house-hold. This position is evident from the following figures.

Table 1.6 **(000 bales)**

Year	Ex-Farm Production	Ex-Gin Production
1997-98	9184	8342
1998-99	8790	7200
1999-2000	11174	9749
2000-2001	10800	10187

(Source: Central Cotton Research Institute Multan)

Another 5% to 10% of ex-ginned quantity of lint cotton used to be supplied undocumented to spinners by the ginners without payment of Sales Tax. Lint cotton supplied in this manner is known as "Gol Mall ".But after exemption of Sales

Tax on cotton seed and oil cake the quantity of this undocumented lint cotton has reportedly reduced substantially.

1.12. Issues Relating to Sales Tax

1.12.1 Suppression of Production

Presently Sales Tax is paid by the purchaser of lint cotton i.e. the spinning mills through the ginner, in accordance with the procedure prescribed under Special Procedure for Ginning Industry Rules, 1996 vide SRO 1271(I)/96 dated 10.11.1996. But sometimes the spinner and the ginner join hand in evading the Sales Tax and certain number of cotton bales supplied to the spinners are not declared by the ginner in his record. This transaction known as supply of " Gol Mal " is made through (a) under reporting the arrival of seed cotton in the factory and, (b) double numbering the cotton bales. The extent of evasion on this account is reportedly in the range of 3-5% of the total production. Yarn manufactured from this portion of cotton is supplied to the unregistered weaving sector without tax payment to the Government.

1.12.2 Delayed Payment by the Spinners

Some spinners get delivery of lint cotton from the ginners under the Ginning Industry Rules but fail to deposit the bank draft of amount of Sales Tax leviable thereon within the prescribed time limit. In this way a substantial amount of Sales Tax goes into arrear. This arrear runs into millions of rupees at any given point of time.

1.12.3 Inadmissible Refund on Electricity

The ginning factories work on seasonal basis but sometimes the refund of sales tax is claimed on electricity bills for the whole year. Moreover, cotton seed , oil cake and oil are exempt from sales tax but refund is claimed on total electricity bill without keeping in view the apportionment formula given in Apportionment of Input Tax Rules 1996 under SRO 698(I)/96 dated 22.8.1996. Refund of Sales Tax is sometimes also claimed by composite ginning factories (having oil mills in the same premises) on electricity consumed during the period when no ginning activity is carried out.

1.12.4 Multiple Registrations

Around 15% to 20% ginning factories are taken on lease by different ginners during the ginning season. There are two types of lease: (a) period lease in which ginning factory is taken on lease for one ginning season and (b) quantity lease in which factory is taken on lease by different lessees for specific lots/number of bales and all expenses, other than Sales Tax, are born by the lesser. These lessees get the ginning factories registered in their own name which result into multiple registrations. This multiple registration causes different problems including unreliability of registration data, problems in the audit of ginning factories and difficulties in recovery against the defaulting registered persons.

1.12.5 Irregular Supplies of Cotton under DTRE Scheme

DTRE schemes provides, interalia, that the purchaser of taxable goods will first get his order of purchase registered with the DSAO office Custom House Karachi on the authentication of which he will be entitled to get delivery of taxable goods without payment of tax. But a number of spinners and ginners are not following this procedure and a sizeable number of cotton bales are got supplied to spinners without intimation/registration with the DSAO office.

1.12.6 Sale Against "MUDDA"

In some cases, cotton is sold on to pay basis which is commonly called (Mudda) in which price is fixed within a specific period; the buyer makes 80% to 90% payment at the time of delivery of lint cotton and the remaining amount is to be paid on finalization of the rate. The ginner issues sales tax invoice when the rate is finalized. This practice is against the provision of section 2(9), 3, 6, 22, 23 and

26 of the Sales Tax Act, 1990. A ginner is required to issue sales tax invoice at the time of delivery of taxable goods and the buyer has to pay sales tax on or before the 10^{th} days of the next month.

1.12.7 Sale Against Credit

Lint cotton is sold on credit basis whereas the rate is fixed at the time of delivery of goods and the amount per maund, per month is also fixed for the credit period. In this situation the ginner issues invoice on the basic price and accordingly the buyer pays sales tax on the same price whereas actually the seller gets more money than the invoice value. The ginner should declare total consideration and the buyer should pay sales tax on the total transaction. The information about the credit sale of lint cotton can be gathered from the other ginners/buyers of adjacent areas and also from the brokers.

1.12.8 Working As Vendor on Conversion Charges

Some ginning units work as vendor and produce taxable goods on conversion charges but do not pay sales tax on conversion charges. The ginners who are working on conversion charges should pay sales tax on conversion charges as per sales tax law. The Department should make survey during the season and trace out such vendors and recover sales tax on conversion charges.

1.12.9 Enforcement Weaknesses

The ginning factories are widely scattered in the rural areas due to which it is quite difficult for the Collectorates to monitor their revenue performance. The Ginning Industry Rules provide, interalia, that the spinners will provide the bank draft of sales tax payable on purchased cotton by 10^{th} of every month, the ginner will deposit this draft in the bank by 15^{th} of the said month and will submit a statement on 20^{th} to the concerned Collectorate giving details of supplies, payment of tax during the tax period and indicate the names of defaulters. While this procedure is generally being observed, the following problems still exist in this system;

i. Some spinners either do not provide the bank draft of sales tax to the ginners despite having taken the supply of ginned cotton or they provide this draft at a belated stage, thus violating the procedure of the Ginning Industry Rules.

ii. It is required under the Ginning Industry Rules that the ginner will issue tax invoice after seven days of supply of cotton. In some cases while the ginner receives the price of cotton immediately; he joins hand with the spinner and delays in issuing the tax invoice enabling the spinner to pay sales tax at a belated stage.

iii. Some ginners fail to deposit the bank draft received from the spinners by 15th of the month and as such cause to declare the spinners a defaulter due to his inefficiency.

iv. Some spinners deposit the amount of payable sales tax directly in the bank without intimation to the concerned ginners. But since the ginner is unaware of this deposit, he reports the sales tax Collectorate that the said spinner is a defaulter. This situation causes hardship for the spinners because this alleged evaded amount of sales tax is got deducted by the department from their refund/rebate claims.

v. Some ginners either do not submit the monthly ginning statement or delay in the submission of this statement which shows details of supply of ginned cotton and payment of sales tax by different spinners, due to which the Collectorate's revenue data remains incomplete.

vi. The monthly statements submitted by the ginners by 20th of each month remain unattended in the Collectorate and are not completely fed in the computer due to which the Collectorate is not in a position to reconcile the revenue data reported by the National Bank nor the Collectorate is in a position to timely draw the list of defaulters for initiating recovery action.

vii. Certain branches of the National Bank receive the drafts of sales tax amount but fail to report this payment to the Collectorate. As such a portion of revenue remains unreported despite the fact that it has been got deposited in the government's account.

1.13 Recommendations and Audit guidelines

1.13.1. Risk Profiling of Ginning Factories

In view of scattered nature of ginning factories it is not possible for the Collectorates to keep an eye on the ginning activities of all of the factories. To discourage supply of "Goll Mall" without payment of sales tax, it is, therefore, desirable for the Collectorates to focus attention on the ginning factories having following characteristics:-

a) Factories owned or taken on lease by the spinning mills.
b) Factories taken on lease by more than one ginners.
c) Factories having persistent reputation of evading tax.
d) Factories located in the remotest areas.
e) Factories showing abnormally lower production vs. the production of adjacent factories.
f) Factories working with generator not on electricity
g) High consumption of electricity per bale.

Units selected on the above criteria would definitely be in manageable number which could easily be focused by the Collectorate. By adopting this risk profiling method there would be no need to visit majority of rest of ginning factories for the purposes of anti evasion activities. Intelligence gathering about high risk units may also be done through PCGA, cotton brokers and reputed ginners.

1.13.2 Revenue Monitoring Through PCGA Figures of Supply

PCGA issues fortnightly report of district- wise production and supply of cotton bales. The Collectorates need to use this information for the purposes of revenue monitoring in a manner that if the revenue from the ginning factories of a district in a given period does not correspond to the number of bales supplied from that area, the suspected ginning factories of this district/area need to be placed under special focus. With this method the Collectorate can properly concentrate on the weaker areas of revenue collection.

1.13.3 Effective enforcement

The elements indicated in Para 1.12.6 indicate administrative weaknesses which can be taken care of by applying the selectivity criteria. The Collectorates need to identify through computer profiles:-

(a) those ginners who default in timely submission of monthly statement on 20th day of the month.

(b) those spinners who generally indulge in delayed/non payments of tax or those having the tendency of direct depositing the tax in the bank without intimation to the ginners and

(c) those bank branches who are habitual in belated reporting of tax deposit.

Instead of going after each and every ginner/spinner/bank branch, the Collectorate should focus on the selected persons for obtaining timely statements, reconciliation of tax payment and recovery of arrears. This targeted approach would be quite manageable and result oriented for the Collectorates. Simultaneously efforts need to be made to feed all the monthly ginning statements received from the ginners so that the Collectorates could have clear picture of revenue figures as well as the defaulting units. However, before making a reference to the other Collectorates for effecting recovery from the refund/rebate claims of the defaulting spinners(other than those whose cases of default are established after due adjudication), a notice need to be issued to such spinners for providing proof of payment, if any.

1.13.4 Regular Liaison with other Collectorates

Besides immediately issuing notices to the spinning units who default in timely payment of Sales Tax on supply of ginned cotton, the ginning based Collectorates, after due notice to the spinners, need to immediately ask the concerned Sales Tax and Customs Collectorates to (a) deduct the recoverable amount of Sales Tax from their refund and rebate claims and (b) ensure that such defaulting spinners don't claim input tax adjustment of defaulted amount. Simultaneously action for black- listing the defaulting spinning units, as provided under rule 5 of the Special Procedure for Ginning Industry Rules 1996, may also be taken.

1.13.5 Production Vs power consumption

While auditing or inspecting a ginning factory the auditors should also co-relate the consumption of electricity units with the figures of production of bales to verify the genuineness of declared production. Moreover, in doubtful cases help should also be sought from the Phutti arrival register, ginning register, baling register, weighment book and despatch register maintained by the factories under the Cotton Control Rules,1966. In addition to this, Bank Statement, bank pledge record of cotton fee and of market fee should also be checked.

1.13.6 Proper Care in Processing Refund Claims

While processing or auditing the refund claims of ginning factories on account of Sales Tax paid on electricity, it should be ensured that the apportionment formula of SRO 698(I)96 is properly applied. The refund is not to be paid on electricity bills which show zero unit consumption or the bill of a composite ginning factory relates to a period when no ginning activity is carried out.

1.13.7 Under Valuation of Lint Cotton

While carrying out audit of a ginning factory, the auditors need to keep in mind the normal trend of values of lint cotton for specific areas. In case of invoices of abnormally lower value, the case needs to be examined thoroughly with a view to detecting the element of under valuation.

1.13.8 Discouraging the multiple registrations

Multiple registration of one ginning factory, on the basis of multiple lease agreements, cause problems for the department in the field of audit and recovery of arrears. As such effort may be make for registration of ginning factories in the name of owners The existing data of registration should be updated scoring out the names of lessees from the list and retaining the names of owners with the Collectorates. For this purpose assistance from the PCGA may also be sought.

1.13.9 Monitoring of Supply under DTRE

It is desirable that the procedure of procurement of lint cotton under DTRE scheme is conveyed to each ginning factory. For this purpose the assistance of PCGA may also be sought for passing on this procedure to ginners through correspondence or seminars/meetings.

1.13.10 Notifying the Defaulters

The latest amendment in Ginning Industry Rules provides that the Collector may notify the names of purchasers of lint cotton who default in payment of Sales Tax to the ginners that they will not be supplied cotton without of Sales Tax. This provision of the rules needs to be used for forcing the habitual defaulters to make the payment of Sales Tax arrears.

GINNING

Summary of Important Information

1. Sales Tax Revenue from Ginned Cotton.

The amount of sales tax on supply of lint-cotton is@ Rs.1700/- per maund (37.324 kg) and bale weight of 170 kg works out to Rs.7743 per bale. This amount increases by Rs. 68/bale on every increase of Rs. 100/maud in the price of lint cotton.

2. Packing Material

i. Per bale consumption of Hessian cloth is around three meters of four-side cover of bale and around 3.5 meters for six-side cover of bale.

ii. Bailing hoops made from steel or plastic strips commonly known as patri are also used for binding the bale. Bailing hoops of steel are used @ 2 to 2.25 Kgs. per bale.

3. Input Output Ratio in the Ginning Sector

Particulars		Out put	
Ginning Sector			
Input / Out put Ratio from Phutti	**Lint Cotton**	**Cotton Seed**	**Wastage**
	33% to 34%	58% to 59%	9% to 7%
Oil Mill Section	**Oil Cake**	**Oil**	**Oil Dirt**
Input / Output ratio from cotton Seed	82% to 85%	10% to 12%	8% to 3%

4. Energy Consumption in Ginning

Average electricity consumption for manufacturing one bale	:	18-20 units/bale
Average disel oil consumption (instead of electricity)	:	5-6 liters/bale.

Chapter 2

SPINNING

List of Paragraphs

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Chapter 2

SPINNING

2.1 Introduction

2.1.1 Annual world consumption of fibers is just less than 40 million tons. While about 20% is processed as endless filament, around 80% is in staple form. The greater part of this 80% is used in production of yarn. The spinning industry is therefore of great significance in all parts of the world.

2.1.2 Spinning describes the process or processes used in the production of yarns or filaments. It is the conversion of a large quantity of individual unordered fibres of relatively short length into a linear, ordered product of very great length by using machines and devices. This term may apply to the drafting and twisting of natural or man-made staple fibres, to the extrusion of filaments by spiders or silkworms, or to the production of filaments from glass, metals or fibre forming polymers.

2.1.3 An important step in converting textile fibres into fabrics for use in making textile end use products is to either make yarns or arrange fibres in some way. The step necessary when fabrics are to be woven, knitted, braided or knotted is the formation of yarns. The whole process is called spinning.

2.2 Raw Materials for Spinning

2.2.1 The fibres in most cases form the raw material from which yarns and *fabrics are produced (yarns may also be made from ribbons, slit films and by* splitting of plastic films). Until recently, most textiles were produced from fibres of primarily natural origin. The important natural fibres presently in use for apparel applications are cotton, wool, flax and silk.

Table 2.1

CLASSIFICATION OF TEXTILE FIBRES

- Textile fibres
  - natural
    - animal
      - silk
      - wool (sheep)
      - hair (alpaca, camel, cow, goat (mohair, cashmere), horse, rabbit (angora), vicuna, etc.)
    - vegetable
      - seed (cotton, kapok, coir)
      - bast (flax, hemp, jute, kenaf, ramie, etc.)
      - leaf (abaca or manila, henequen, phormium tenax, sisal, etc.)
    - mineral (asbestos)
  - man-made
    - synthetic polymer
      - *polycarbamide* (poly(methylene urea))
      - polyolefin
        - *polyethylene*
        - *polypropylene*
        - *fluorofibre* (PTFE)
      - polyvinyl derivatives
        - *acrylic*
        - *modacrylic*
        - nytril (poly(vinylidene dinitrile))
        - *chlorofibre*
          - poly(vinyl chloride)
          - poly(vinylidene chloride)
        - *vinylal* (insolubilized poly(vinyl alcohol))
        - polystyrene
      - *polyurethane*
        - straight-chain type
        - segmented (*elastane*)
      - *polyamide* or *nylon*
      - *polyester*
      - polycarbonate
      - synthetic polyisoprene (*elastodiene*)
    - natural polymer
      - *alginate*
      - natural rubber (*elastodiene*)
      - regenerated protein (*protein*)
        - animal (casein)
        - vegetable (arachin, zein)
      - regenerated cellulose (*rayon*)
        - *viscose*
        - *cupro*
        - *modal*
        - *deacetylated acetate*
      - cellulose ester
        - *acetate*
        - *tri-acetate*
    - other (carbon, glass, metal, silica)

These fibers have certain inherent characteristics that make them suitable for conversion into yarns and ultimately into the fabrics that are most commonly used in day to day wear. In addition, there are many other natural fibres such as jute, hemp, ramie, sisal and kapok that have been utilised for certain specific end uses.

2.2.2 In recent years, this has been supplemented by a variety of new fibres called "man-made" fibres (which include regenerated and synthetic types). Most of the developments in the field of regenerated and synthetic fibres have been directed toward simulating the properties of natural fibres and toward utilizing the production techniques already employed in the processing of natural fibre yarns.

2.2.3 Yarns can be made either from short staple length fibres or from filament fibres. Staple fibres require considerably more processing than filament fibres to form yarns. Any fibre with a practically limited or finite length is called a staple or spun fibre. It can be a natural fibre (e.g. cotton, wool etc.) or a man-made fibre (e.g. viscose, polyester, acrylic or nylon). Classification of textile fibres is shown in Table 2.1.

2.2.4 Cotton grading and its impact on production

There are usually four grades of cotton in Pakistan such as A, B, C, & D. Each mill has its own grading system which usually depends on quality parameters of cotton such as trash %, fibre length including uniformity ratio and floating fibre %, fineness (micronaire value), fibre strength (pressely strength) and moisture content % etc.

Cotton of grade "A" will definitely get maximum production as compared to other grades, provided the other production parameters remain the same. This increase in production is mainly because of less T.M (measure of twist) in yarn and better running efficiency of the Ring Spinning Frame.

Table 2.2

Proposed grades of Pakistani Cotton

S. No	Properties of Cotton	A	B	C
01	Trash%	5.1-6.5	6.6-7.5	7.6-9
02	Fiber span length (2.5%) in inch	1.7-1.09	1.04-1.06	1-1.03
03	Fiber span length (50%) in inch	0.535-.545	.50-.52	.47-.48
04	Uniformity ratio %	50-51	49-52	47-48
05	Micronaire value (Fineness)	4.5-4.8	4.9-5.2 3.5-3.9	3.0-3.5 5.2-5.5
06	Pressley Strength (1000 lbs / Sq.inch)	86-89	82-85	7981
07	Floating Fiber Index (%).	11-15	16-20	21-25
08	Moisture content (%)	7.6-9	8.6-9	8.6-9

2.3 Spinning Systems

The common aim of all spinning systems in fibre spinning is to produce a yarn by binding the fibres together with the help of twist. To achieve this in any spinning system fibres have to be processed in stages in order to have them in a suitable form for final spinning of yarn. The spinning system thus needs several machines or devices for this purpose.

Basically there are two spinning systems based on the length of fibers:

i. Short staple spinning system, also know as cotton spinning system, processing fibers with a length of up to about 50 mm.

ii. Long staple spinning system, processing fibers with a length more than 50 mm which are sub divided as follows:-

   a) Woolen spinning system
   b) Worsted spinning system
   c) Semi-worsted spinning system
   d) Jute & Flax spinning system

2.3.1 Cotton spinning system

Most mills use some types of automated system in the manufacture of yarns. This automation may involve all the steps from opening the fiber bale to the final yarn spinning, or segments of the process may be automated. The general steps in ring spinning are cited in the following paragraphs, with automated processes indicated where appropriate.

2.3.1.1 Blending, Opening and Cleaning

The cotton arrives at mill in large bales. The compressed mass of raw fiber must be removed from the bales opened, blended, opened, and cleaned.

Blending

Man-made fibres e.g. viscose staple fibre and polyester staple fabric, which have similar length characteristics as of cotton, can be processed on the cotton spinning machinery. In order to manufacture blended yarn from cotton and man-made fibres, blending of the fibres in the required proportion is done either at the blow-room or at the drawing frame stage.

Blending is necessary so as to obtain uniformity of fiber quality; opening is necessary in order to loosen hard lumps of fiber and disentangle them; cleaning is required to remove trash-such as dirt, leaves, burrs, and any remaining seeds-in order to prepare the fiber for spinning into yarn. These functions are accomplished through a continuous series of stages.

Mechanical bale pickers pluck thin, even layers of the matted fiber from each of a predetermined number of bales in turn and deposit them into a hopper. The fiber is mixed and passed to an opener. As the mass of fiber passes through the opener, cylinders with protruding fingers open up the lumps and free the trash.

The kind and number of cylinders, or beaters, employed depend upon the type of cotton that is being processed; the commonly used porcupine beater revolves at a speed of about 1000 revolutions per minute. As the cotton is opened, trash falls through a series of grid bars. When the cotton emerges from the opener, it still contains small tufts with about two-thirds of the trash. It may be conveyed as a lap, which is a loosely entangled mass about 1 inch thick and about 40 inches wide, or it may be fed by chute directly to the card for further cleaning and fiber separation. (Fig 2.1, 2.2, 2.3, 2.4 and 2.5).

2.3.1.2 Scutching or Picking

When the cotton bales arrive at the mill they are opened and fed into a blender, which arranges the fibers for uniformity. They are then processed through the picker. This machine removes or picks out the heavier impurities such as seed and dirt. It then forms the lint into laps (loosely entangled mass about 1 inch thick), which resemble rolls of absorbent cotton. Each lap runs about 40 inches wide and 18 inches in diameter.
Cotton may also be fed by chute, directly to the carding machine

2.3.1.3 Carding

In the intermittent process the picker lap is transported and placed at the feed end of the carding frame. In the automated system, fibers are fed directly to the carding frame by either air systems or a combination of air and gravity.

Carding continues the cleaning process, removing fibers too short for yarns and separating and partially straightening the fibers so that their longitudinal axes are somewhat parallel. These fibers are then spread into a thin, uniform web. The web moves into a funnel-shaped device where it is gathered into a soft mass and formed into the card sliver. This sliver is a ropelike strand of fibers about ¾ inches to 1 inch in diameter. The card sliver is not completely uniform in diameter, and the fibers are considerably more random in arrangement than a combed sliver. Carded yarns go directly to the drawing machine; combed yarns receive additional processing before drawing. (Fig 2.6).

2.3.1.4 Combing

For high-quality yarns of outstanding evenness, smoothness, fineness, and strength, the fibers are combed as well as carded. In the combing operation several card slivers are combined and then drawn onto the comb machine where they are once again, spread into a web. As the web is formed there is further cleaning and straightening of the fibers.

Short fibers are removed during combing. After the combing, the fibers are pulled from the combing wires and formed into a combed sliver. This sliver will produce yarns of high quality. (Fig.2.7). The combing process has the advantage of better luster and better strength to the yarn. The knitting industry generally uses combed yarn, which is costlier than carded yarn.

2.3.1.5 Drawing

Depending on the quality of yarn desired, drawing follows either carding or combing. Several slivers are combined and conveyed to the drawing machine, where they are pulled together and drawn out into a new sliver no larger than one of the original single slivers. If the yarn is to be and intimate blend of two or more fibers, the slivers will be composed of different fibers. For example, one sliver of cotton fiber for each sliver of polyester fibers will produce a blend of approximately 50 percent polyester and 50 percent cotton. Drawing does not insert any twist into the drawn sliver. (Fig. 2.8 and 2.9).

2.3.1.6 Roving

The sliver from the drawing frame is taken to the roving frame where it is attenuated until it measures from 1/4 to 1/8 of its original diameter. As the roving strand is ready to leave the roving frame, a slight twist is imparted to the strand of fibres and it is then ready for the spinning frame. The fineness and intimacy of blending of the yarn depend to some degree on the number of times the slivers are doubled and redrawn prior to the roving operation. (Fig.210 and 211).

2.3.1.7 Spinning

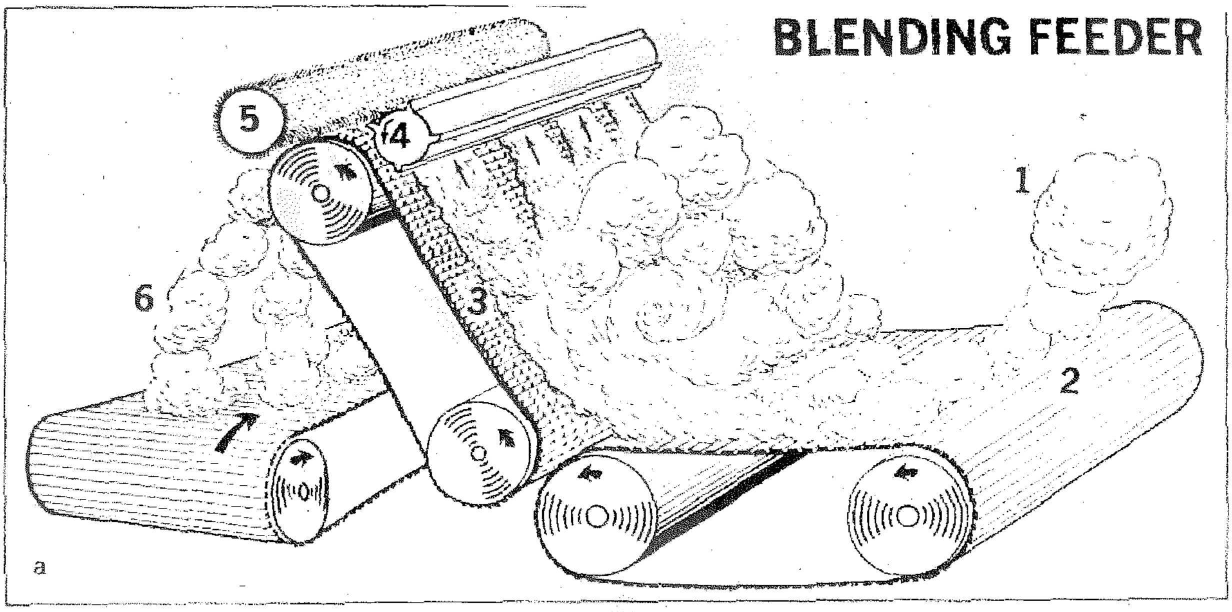
The final process in the manufacture of spun yarns is the actual spinning operation. In the spinning frame the roving is further stretched and drawn to the ultimate diameter of the final yarn. During this operation, twist is inserted. Several methods are used for inserting twist into the final yarn, but the most common for fibers of the length of cotton is the ring-spinning system. In ring spinning, the drawn-out roving is guided in a downward direction and through the traveler, a small inverted u-shaped device. The spindle upon which the yarn is wound rotates at a speed of approximately 16,000 revolutions per minute; the traveler moves around the ring. As the spindle revolves to wind the yarn, the yarn passes through the traveler, which carries it around on the ring. This process imparts the desired amount of twist. The yarn formed on the spinning frame is a single yarn. (Fig. 2.12, 2.13 and 2.14).

NOTE: Spindle is a long metallic shaft on which empty bobbins are mounted. It rotates at considerably high speed like 16000 to 20000 rpm. Its purpose is to help in insertion of twist and winding of yarn on ring bobbins. Usually there are 480 spindles in one ring frame.

2.3.1.8 Winding, conditioning and packing

Winding converts the yarn on ring bobbin containing a small quantity about 60 - 100 grams to a bigger package i.e. cone with a yarn weight of about 2.5 - 4.5 Lbs, which is more suitable for feeding to warping operation of weaving or knitting process. Quality of yarn is also improved by clearing its faults. Waxing can also be applied for winding of hosiery yarn.

The yarn cone is kept is the conditioning room for about 24 hours to bring the moisture up to the required standard i.e. about 8.5%. Lastly the yarn cones are packed for further use.


BLENDING FEEDER
1
2
3
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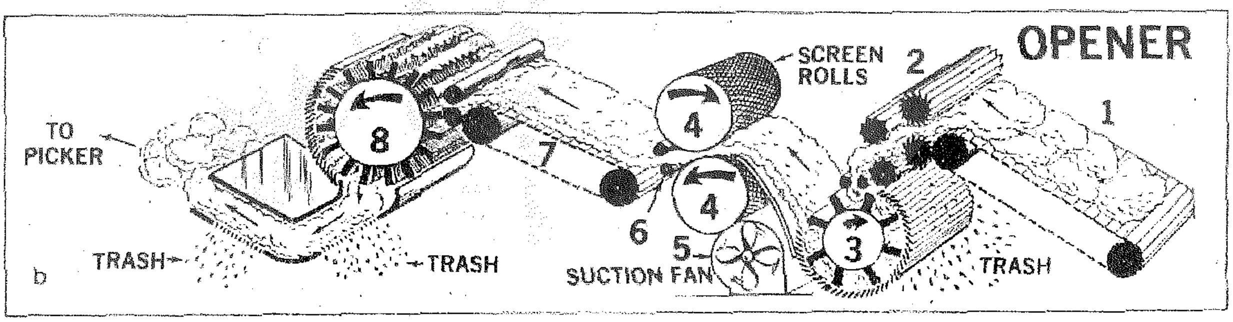
a


OPENER
SCREEN ROLLS
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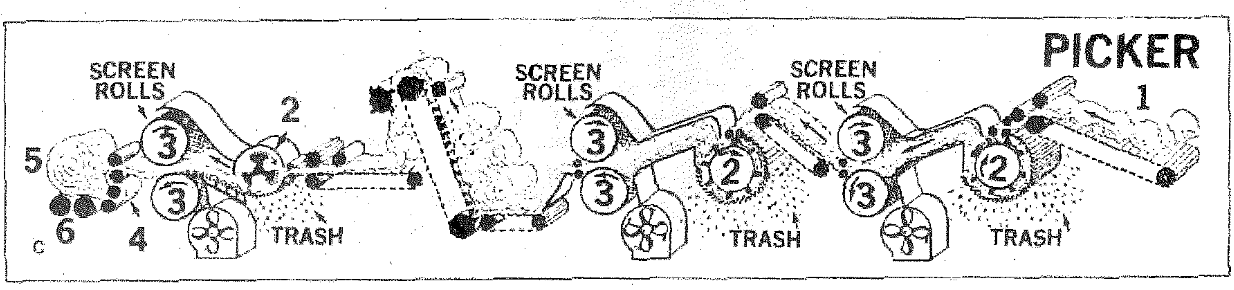
TO PICKER
TRASH
TRASH
TRASH
SUCTION FAN
b


PICKER
SCREEN ROLLS
SCREEN ROLLS
SCREEN ROLLS
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TRASH
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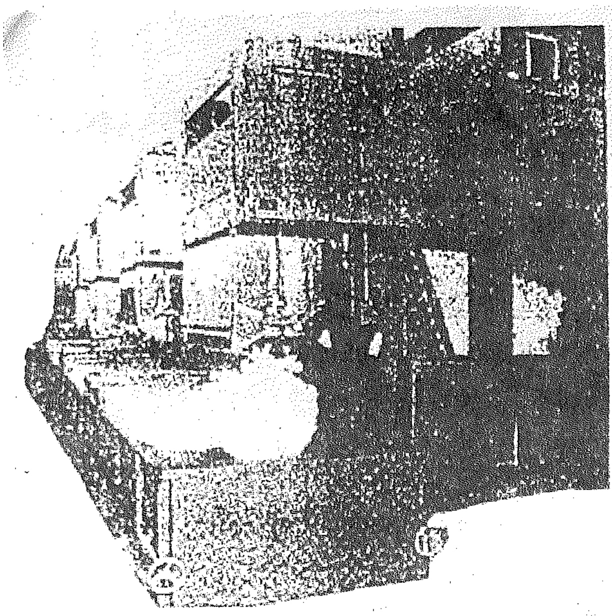
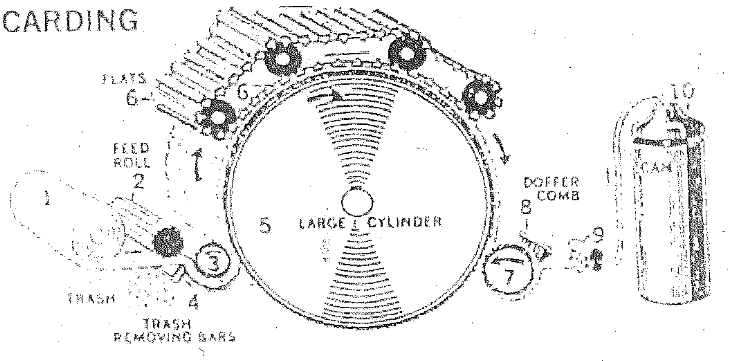
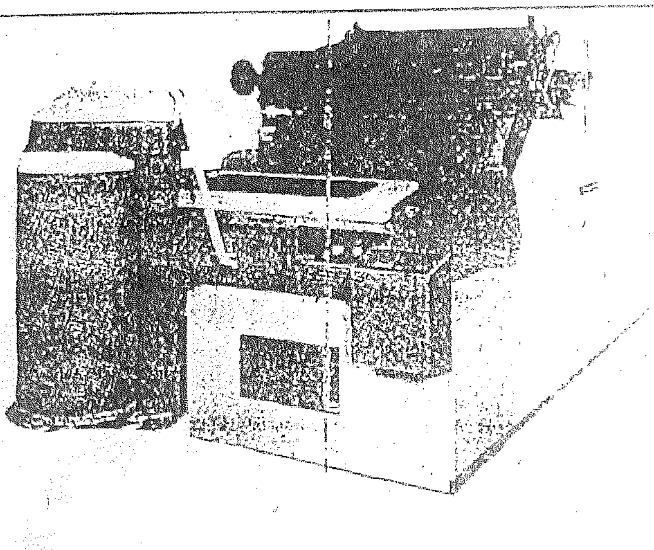
c

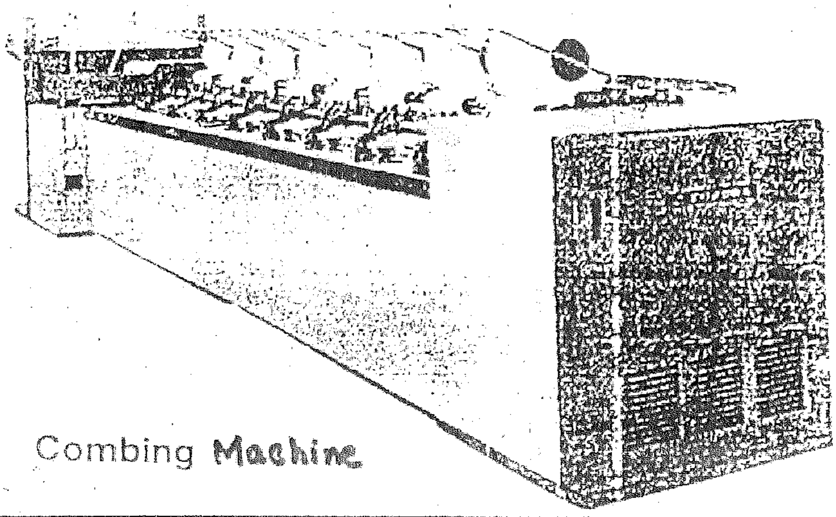


CARDING



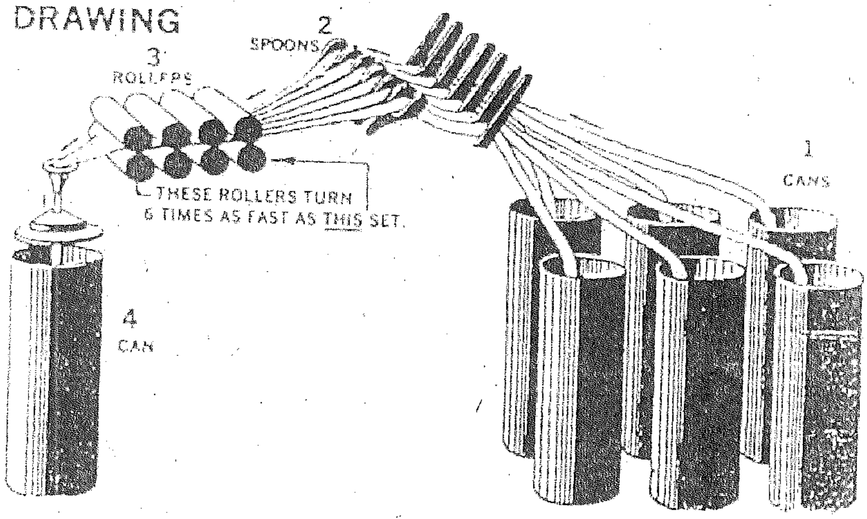


Carding M/c.

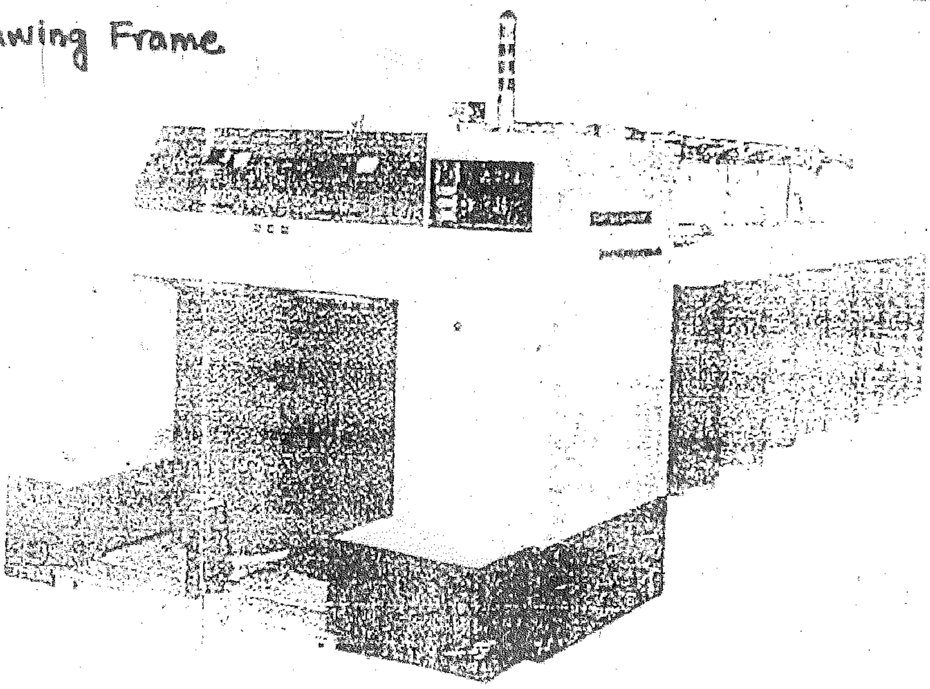


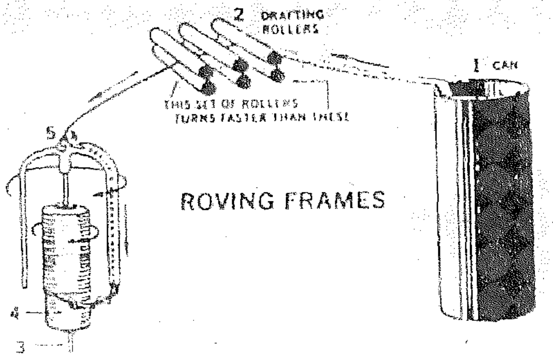
Combing Machine

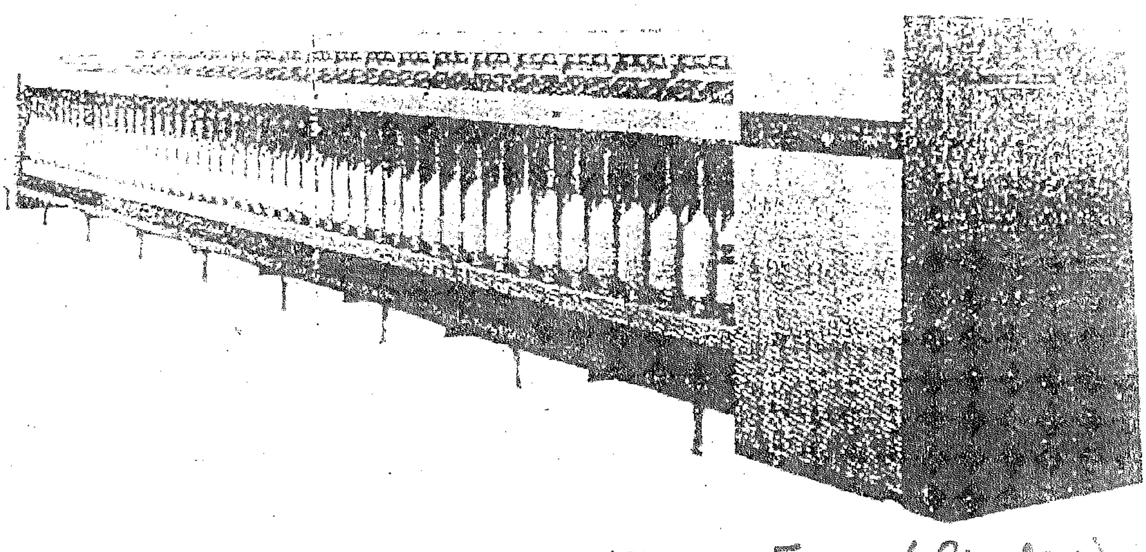
DRAWING



Drawing Frame

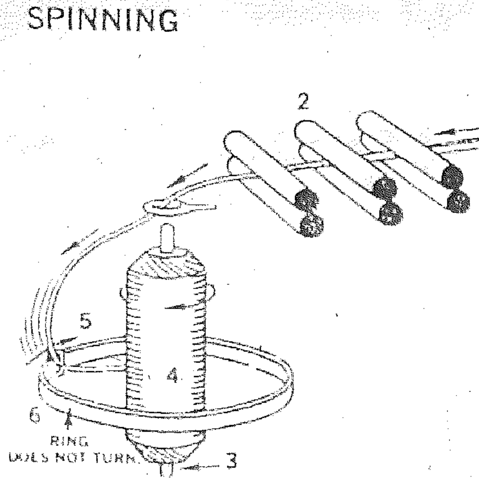


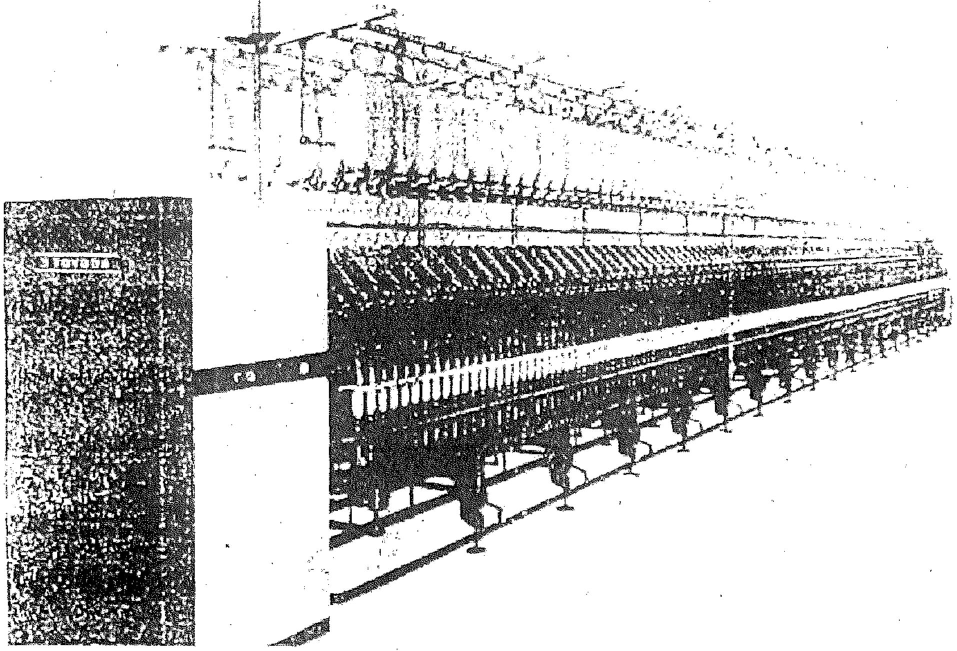


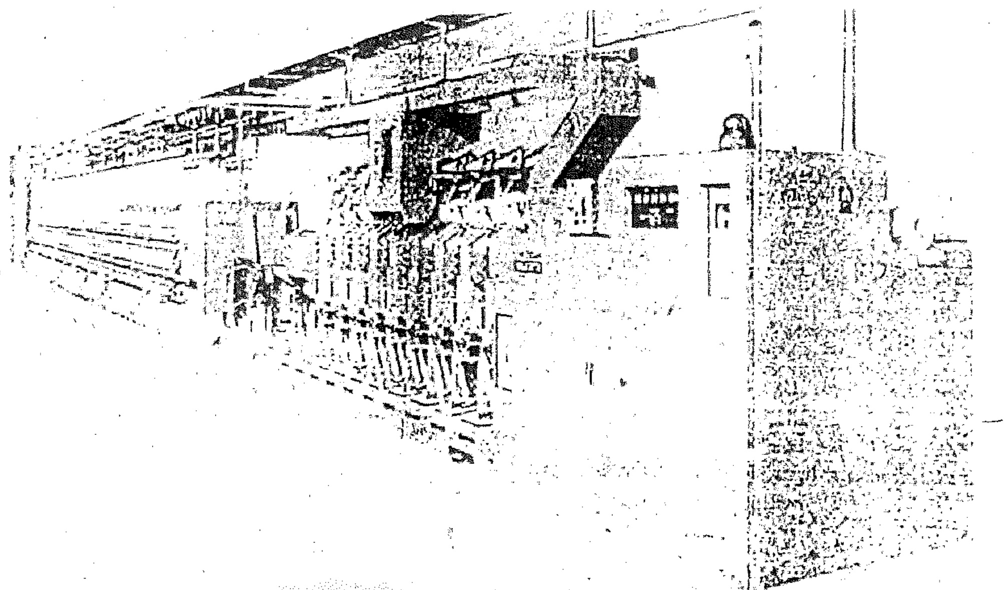


Roving Frame (Simplex)

SPINNING







Winding Linked with Spinning

2.4 Spinning Techniques for Staple Spun Yarns

The spinning machine, on which the yarn is finally spun, is always the final stage in a spinning mill. Most important spinning techniques are open end spinning and Ring Spinning.. The primary difference between the conventional ring spinning and the open-end spinning is that in the latter the spool does not need to be rotated in order to put twist into the yarn. Furthermore, much larger spools can be wound, thereby providing very long lengths of knot-free yarn and consequent reduction in handling the spools. The system also allows for greater automation in yarn production and therefore provides greater production economy. Open-end spinning can produce yarn spun at a rate of 3 to 5 times that of the conventional ring spinning. While the open-end spinning process provides better fiber elongation, the resultant yarn is only as even as a good ring spun yarn, but not better. The yarn produced has excellent dyeability, particularly with bright shades.

On the other hand, open-end spinning has its limitations. Problems arise in spinning yarns of 100 percent manmade staple (with the exception of rayon staple) on account of the fiber finish, which gets deposited in the rotor and causes clogging; and it is not possible to spin combed yarn. The yarn has a carded character and it has a rougher, sandier hand. The yarn counts are generally lower which limits their use to heavier, coarser fabrics, such as denims, towels, some poplins, and interlinings. Although open-end yarns are spun with 20 percent more twist , they are 15 to 20 percent weaker due to their coarseness. Also, the character of these yarns due to the twist formation is sufficiently different from that of ring spun yarns so that they cannot be mixed in manufacture.

2.4.1 Open End Spinning (Rotor Spinning)

This spinning method is the most successfully alternative to Ring spinning for the manufacturing of short-staple yarns of cotton count ranging 1^s to 20^s

Long staple open-end spinning machines are used mainly for the manufacturing of coarse count yarns from long staple man-made fibers. However, it is difficult to spin Wool on this system of spinning

There are so many sub methods of open end spinning out of which only.

Rotor spinning (most popular method also known as Open End spinning) is available in Pakistan.

2.4.1.1. Rotor spun yarn counts in Pakistan

Range from 4^s-20^s but the popular yarn counts are 6^s, 7^s, 10^s, 16^s & 20^s while the most popular counts are 6^s & 10^s.

2.4.1.3 Machinery for rotor spinning

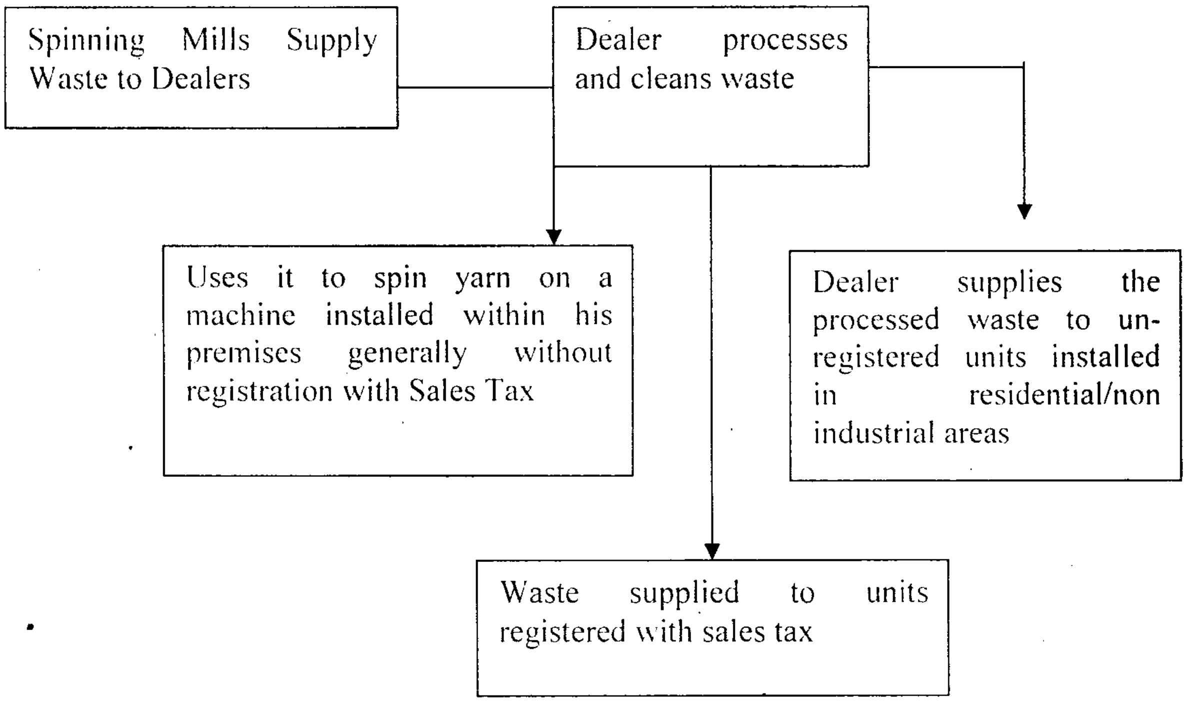
Most of the mills in Pakistan contain old machines such as BD-200 and RN type (Czech) while some have modern machines such as Auto-Coro made by Schlafhrost (Germany).

2.4.1.4 Raw materials used for rotor spun yarn

Waste from the ring spinning process is the main raw material for rotor spinning mills. This waste is of different qualities like, Dropping, Lickerine, AC Filter, Gutter, Hard Waste, Ring Sweeping, Comber Noil, Nimafil, Low grade polyester & polyester waste etc. The price of this waste ranges from Rs. 2/- per Kg to Rs. 40/- per Kg according to quality and availability of waste.

2.4.1.5 About 50-90% spinning waste is mixed with raw cotton on conventional machinery for producing medium and low quantity rotor spun yarn count 4^s – 16^s.

10-25% spinning waste is mixed with raw cotton on modern rotor machine for the production of comparatively better quality yarn counts ranging from 6^s to 20^s Spinning waste also some times includes about 5-20% polyester fiber waste for increasing strength of yarn. The yarn manufactured from cotton waste is estimated to be 5%-8% of total yarn production by textile industry.



2.4.1.6 Calculation of production in Rotor spinning

Production (Ounces per rotor per shift OPS)

=Rotor rpm/tpi x efficiency % / yarn English count x 0.254

Where TPI=Rotor RPM / delivery rate in inches per minute.

2.4.2 Ring spinning

The basic cotton system is the ring spinning process. While a variety of other methods for preparing cotton yarns are in use, the ring process remains the most widely used and the process best adapted to preparing yarns of entire count range from Ne 05-120.

This is the oldest and therefore also referred to as classical or conventional process. This is employed in all the four spinning systems mentioned above. This technique has already been discussed in previous paras.

2.4.3 Air-Jet Spinning

This is another method of spun yarn manufacturing. This method uses air nozzles to tangle the fibres into yarn. As in open-end spinning, air-jet spinning uses sliver as an output, making roving unnecessary. The finished yarn is also wound directly onto a ready-to-sell package.

2.4.4 Self-Twist Spinning

A method of manufacturing yarn from roving fed to a drafting unit; the emerging strand of fibres is subject to a false-twisting action, which can be imported in a number of ways, two strands delivered from the false-twist system are brought together through a guide, and the twist energy in the two strands causes then to wrap around each other.

2.4.5 Twist-Less Spinning

By this method of spinning yarn is prepared without twist in order to obtain special properties like increased softness and dyeability.

Table 2.3
Different combinations of cotton spinning machinery in Pakistan Producing single Ring Spun Yarn

Spinning machines in Pakistan are old, modernized and modern, having a great variety as regards their makes and models. Their common combinations can be classified into three types which, inter alia, effect the production efficiency (OPS) indicated in table 3.11:

Name of department	Combination A	Combination B	Combination C
Blowing Room	Trutzschler, Rieter & Cross-Rol With chute feed system	Trutzschler (old) Toyoda &Chinese	Chinese (Old)
Carding	Trutzschler, Cross-Rol & Rieter With Auto – leveling	Cross-roll (old)& Howa Chinese (New)	Chinese
Drawing Frame	Rieter, Trutzschler & Toyoda With Auto-leveling	Toyoda & Howa, Zinser & Reiter (Old)	Toyoda (Old)
Comber	Rieter, Marzoli & Toyoda	Toyoda & Howa & Reiter (Old)	________
Roving Frame	Toyoda (New) & Zinser	Toyoda & Howa & Chinese (New)	Chinese
Ring Frame	Toyoda (New) With Inverter & Auto-doffing	Toyoda, Howa, & Chinese (New)	Chinese
Winding	Murata (New), Savio & Schalphrost -338	Murata	Murata & Manual
Air-conditioning	Luwa (New) & Best Air	Luwa & Pakistani	Luwa & Pakistani

Note: - Reiter & Luwa	From	Switzerland
Trutzschler	- do -	Germany
Savio & Marzoli	- do -	Italy
Cross-Roll	- do -	U.K
Toyoda, Howa & Muratta	- do -	Japan
Best Air	-do-	Taiwan

2.5 Basic Types of Yarn

A textile yarn is an assembly of substantial length and relatively small cross-section of fibres and / or filaments with or without twist.

Types

- Spun yarn
- Filament yarn
- Single, plied and cabled yarns (Compound yarns)
- Yarns with zero twist
- Novelty yarns

2.5.1 Spun yarn (Most popular)

Spun yarn is that yarn which is made by the spiral arrangement of staple fibres.

The most common spun yarns are;

- Ring spun yarns
- Rotor spun yarns
- Core spun yarns — Not available in Pakistan
- Fascinated yarns — -do-
- Wrap spun yarns — -do-
- Self-twist yarns — -do-
- Friction spun yarns — -do-

2.5.1.1 Ring spun yarn

- Carded yarn
- Combed yarn

Combed yarns are better quality yarns (mostly used as hosiery yarns) whereas carded yarns are relatively lower quality yarns.

Usually finer and medium count yarns are combed. These yarns are produced by the additional combing process.

2.5.1.2 Rotor Spun Yarns

In these yarns fibres are bound together by twist. Rotor spun yarns are generally produced from short staple fibres. In general, these yarns are more regular but weaker than comparable ring spun yarns.

Table 2.4

Flow chart of carded yarn (Ring Spun) manufacturing processes

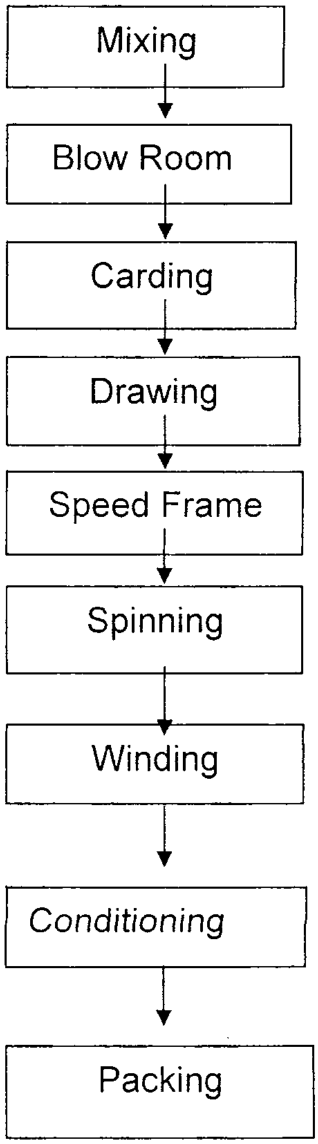


Table 2.5

Flow chart of combed yarn (Ring Spun) manufacturing processed

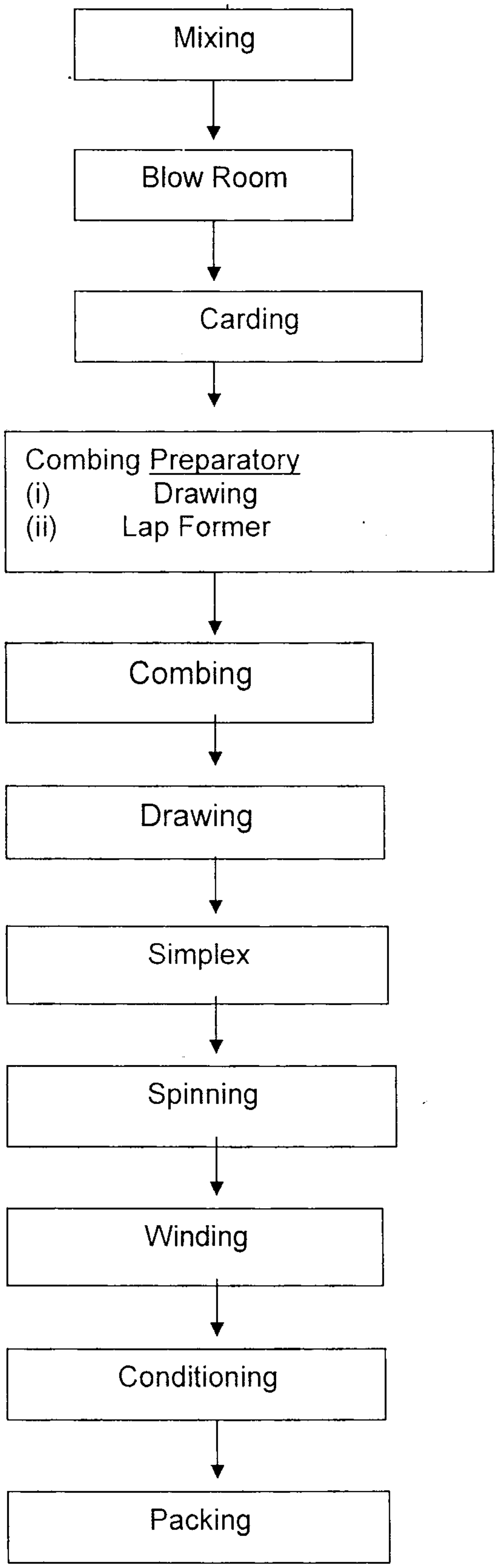


Table 2.6

Flow chart of Rotor Spun Yarn (Open End) manufacturing processes

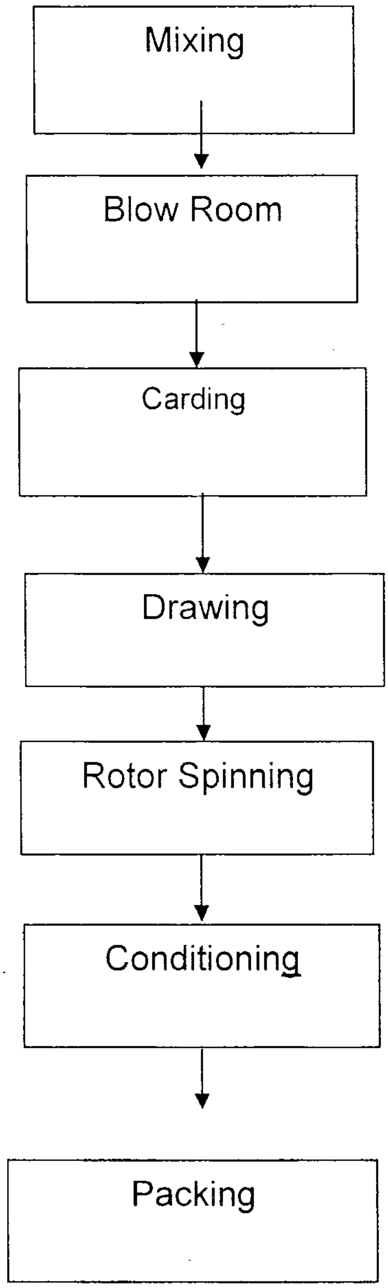


Table 2.7

Flow Chart of Woolen System

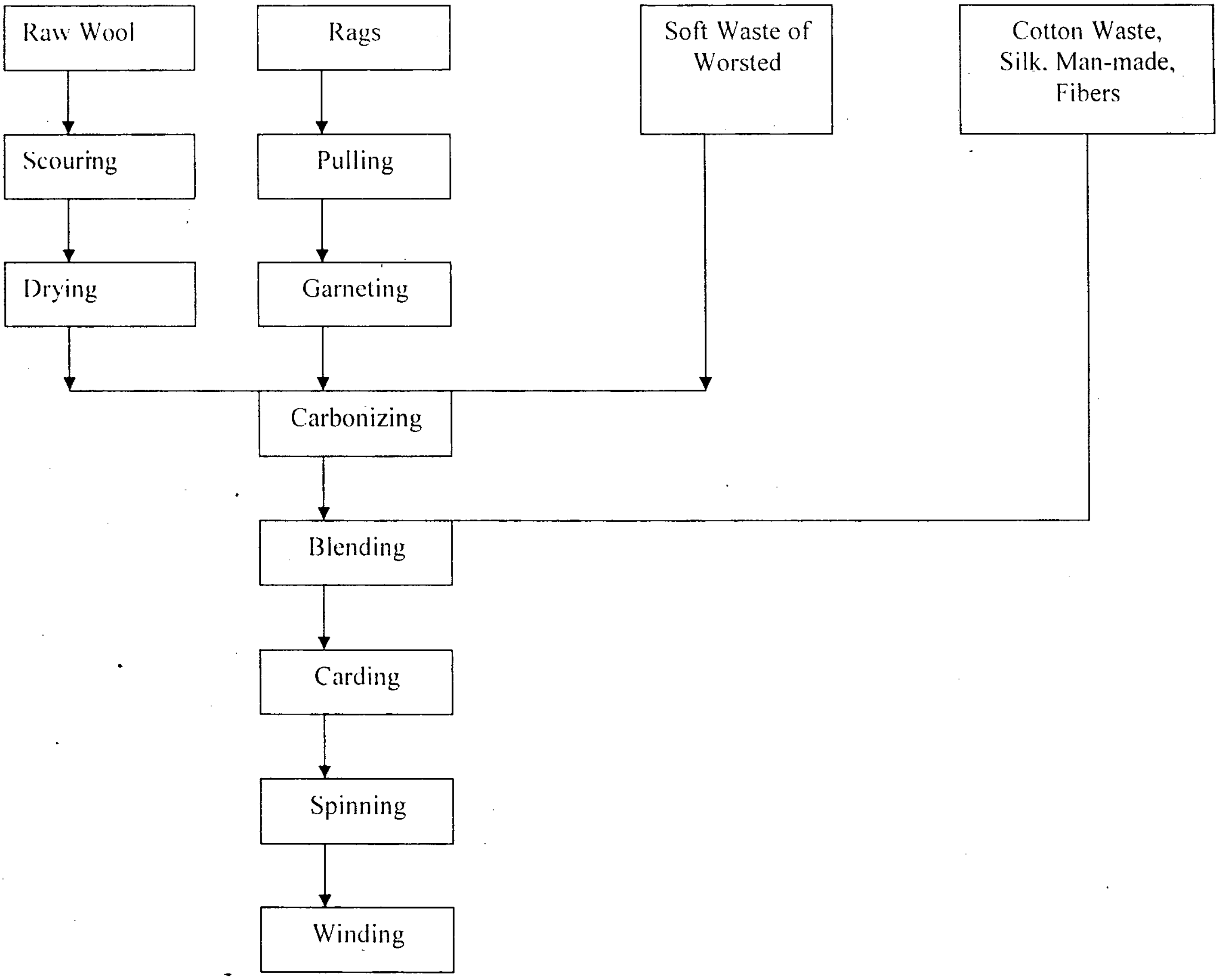


Table 2.8

Flow Chart for Jute

Blend Jute

↓

Bale Opener

↓

Spreader
(Silver delivered by roll-former)

↓

Carding
(Breaker + Finisher)

↓

Drawing
(3 drawing frame, pin control drafting)

↓

Roving
(Pin control, Flyer delivery

↓

Spinning
(Flyer spinning)

↓

Winding with
clearing

2.6 Yarn Count

In the spinning process, there is always a fixed relation between the weight of the original quantity of fiber and the length of the yarn produced from that amount of raw material. This relation indicates the thickness of the yarn. It is determined by the extent of the drawing process and is designated by numbers, which are called the yarn count.

2.6.1 System of Count (Ne)

The standard for the yarn count in cotton is one pound of fiber drawn out to make 840 yards of yarn; the resultant thickness or size is known as count number 1, or 1s or 1i, or Ne 1. If the yarn is drawn out farther, so that one pound makes twice 840 yards, it is identified as Ne 2 or 2s or 2ı. Thus, Ne 2 yarn will be finer than Ne 1. A still finer yarn is Ne 10, as it indicates that 1 pound of cotton is drawn out to ten times 840 yards. The higher the numbr of the yarn count, the finer the yarn in size. Yarn counts up to Ne 20 are called coarse yarns; 20 to 60 are medium yarns; about 60 are fine yarns. Up to Ne 20, the count rises by single numbers. Only even numbers are used between 20 and 60. Above Ne 60, the count rises by intervals of 5 until 100, after which an interval of 10 is used. As an example of size or diameter, cotton sewing thread used for general purposes is Ne 50 or 60. The very finest cotton yarns spun have been as high as Ne 400, the product of 1 pound of cotton drawn out to strand 336,000 yards long [almost 200 miles or about 300 kilometers (km)]. Extremely fine yarns are difficult and costly to manufacture because of the greater care required in spinning and the greater amount of twist required. The power requirements increase geometrically with the increase in spun yarn count.

Count is measured by determining the weight of a certain length of yarn. Normally, 840 yards of yarn is weighed and count is calculated by the following formula:

Count (Nec)=8.33 x L/W

["L" is length in yards]

["W" is weight in grains]

[one LB=7000 grains]

e.g 8.33 x 840/7000= 0.9996 or Ne1 or 1s.

2.6.2 Metric Count (Nm)

This system is common in continental Europe. It is defined as, Number of kilometers length of yarn in a kilogram.

Count (Nm) = length in kilometers / kilogram

Metric count = English cotton count x 1.69

2.6.3 Denier system

In this system count is defined as number of grams of yarn per 9000 meters. This system is only used for filament fibre / yarn.

2.6.4 Tex system

In this system count is defined as number of grams of yarn per 1000 meters. This is also known as Universal system and is most common direct system is use. In this system, the coarser the yarn, the higher the Tex number.

Table 2.9

Yarn Count Standards

Fibre (1Lb)	Count Symble	Length in Yards
Cotton and cotton blend	Nec	840
Linen	NeL	300
Wool and wool blends	Nac/Nar	1600
Worsted, worsted blends and 100% staple acylic	NeW	560
Spun Staple silk	NeW	840
All 100% manmade staple fibres except acylic	NeW	840

Table 2.10

2.7 Count-Wise usages of spun yarns

Count (N_e.)	Usages
6 -12	Rugs, mats, Industrial (ropes, tyre cord & bellsetc) carpets, towels. canvas, tents, niwar, duck & denim, curtain & sofa cloth. Heavy bed sheets & winter clothes like khaddar etc. (From rotor spun as well as ring spun yarns).
12-22	Towels, Hand bags, curtain & table cloth, bed sheets, upholstery, gloves, leggings, latha, sports wear & Army uniform, (12^s – 16^s can also be rotor spun),twill/drills fashion garments, knitted goods, socks/jogging suiting.
22-32	Sports wear, upholstery, latha, poplin, sheeting & suiting cloth, under garments, hand kerchief.
32-6	Cambric, sheeting, lawn, high quality suiting, ladies under garments, scarf & sewing threads etc.
60-100	Fine sheeting, fine suiting, voil & lawn etc.

Table 2.11
Count Conversion Formula

	Tex	Dtex	Den	Nm	Ne_c	Ne_W	Ne_L	grains / yd
tex =		dtex 10	den 9	1000 Nm	590.54 Ne_C	885.8 Ne_w	1653.5 Ne_L	gr/yd .70.86
dtex =	Tex. 10		den 0.9	10000 Nm	5905.4 Ne_c	8858 Ne_w	16535 Ne_L	gr/yd .708.6
den =	Tex. 9	Dtex.0.9		9000 Nm	5314.9 Ne_c	7992.3 Ne_w	14882 Ne_L	gr/yd .637.7
Nm =	1000 Tex	10000 dtex	9000 Den		Ne_c 1.6934	Ne_w 1.13	Ne_L .0.6048	14.1 gr/yd
Ne_c =	590.54 Tex	5905.4 dtex	5314.9 den	Nm. 0.5905		Ne_w 1.5	Ne_L 2.8	8.33 gr/yd
Ne_w =	885.8 Tex	8858 dtex	7972.3 den	Nm. 0.8858	Ne_c . 1.5		Ne_L 1.87	12.5 gr/yd
Ne_L =	1635.5 Tex	16535 dtex	14882 den	Nm. 1.6536	Ne_c . 2.8	Ne_w .1.87		23.33 gr/yd
Grains/yd=	Tex 70.86	tex 708.6	den 637.7	14.1 Nm	8.33 Ne_c	12.5 Ne_w	23.33 Ne_L	

Nm = metric count Ne_c =cotton count Ne_w = worsted count Ne_L = linen count

How To Use Conversion Table For Example; If Tex count is to be converted into Metric count (NM),'the given formula in the table is 1000/TEX i.e., divide 1000 by the TEX count.

2.8 Production of Spinning Mills

Production of yarn in spinning mills is taken in weight units per unit time. The standard for this purpose is ounces per spindle per shift (OPS) i.e., number of ounces of yarn produced on one spindle in one shift of eight hours.

2.8.1 Calculation of Production

With the information of OPS, it is quite simple to calculate production of a spinning unit in lbs or kgs per day for a particular count.

Example: Total yarn production in lbs/day is =OPS/16 × 3×No. of spindles

OPS (ounces per spindle per shift) can be calculated by the following formula:

OPS=spindle speed/TPI ×efficiency% /yarn count (English) ×0.254

Spindle speed=Speed of spindle in rpm.

TPI= Twists per inch

Production Efficiency% = Working efficiency in per cent

Yarn count = count of yarn in English cotton system.

2.8.2 Factors Influencing Production

Rate of production is influenced by the following factors:

2.8.2.1 Spindle Speed

Rate of production is directly proportional to speed of spindle. However, it is not very simple to increase the speed of spindle. It depends on mechanical excellence of machine and fibre parameters. Therefore, production is subject to make, model, condition and mechanical settings of machine. It also depends on fibre length, fineness, maturity, and strength and trash % of raw material. Spindle speed can be measured by gearing method but, in mills daily practice it is measured very quickly by stroboscope.

2.8.2.2 Twist

Rate of production is indirectly proportional to amount of twist inserted in yarn. For finer yarns more twist is required and for coarser yarn relatively less twist is inserted. Amount of twist depends on fibre type and its quality parameters. Twist also depends on end use and quality of yarns to be spun. Amount of twist can be measured by Twist Tester.

2.8.2.3 Count

Rate of production is different for different yarn counts. Production of finer counts is lesser than the production of coarser counts.

2.8.2.4 Efficiency percent

Efficiency factor is very important for actual production. It is related to stops of machine. More the stops, lesser the production. The usual stops are due to:

- Doffing of prepared yarn bobbins
- Maintenance work
- Technical troubleshooting
- Power shut downs
- Shortage of feeding material (roving) from speed frame
- Replacement of empty roving bobbin with filled bobbin on spinning frame creel
- Count change
- End breakage rate

End breakage rate depends on the type and quality of raw material, spinning preparatory process control, type and weight of traveller, make and model of spinning frame and atmospheric conditions of spinning room.

2.8.3 Economics of yarn production

The cost of yarn has two components.

- Overhead (Fixed or Indirect costs)
- Variable (Direct costs)

2.8.3.1 Indirect Costs

- Financial charges
- Cost of land & building
- Telephone
- Depreciation of machinery and equipments
- Consumable materials for maintenance, repairs & replacements
- Insurance
- Stationery etc.

2.8.3.2 Direct Costs

- Raw materials
- Wastages
- Packing
- Wages
- Energy cost (mainly electricity)
- Transport

The actual yarn costs can be worked out for any unit of time like shift, day or weekly indirect cost plus weekly direct costs, divided by the number of units of yarn manufactured during that unit of time.

Table 2.12

Approximate Ranges of Production in O.P.S. For Popular Pakistani Single Yarns Spun on Cotton System Using Ring Spinning Method

Yarn Counts (Ne)	From Raw Cotton	From PC blends (50-50)	From man made fibers and their blends
10^s	19 - 23	22 – 26	-
16^s	12.5 – 14	14 – 17	-
20^s	9.25 – 11.5	11.5 - 13.5	12.5 -14.5
24^s	6.5 – 8.5	8.5 - 10.5	9.5 – 11.5
30^s	5 – 6.5	7 – 8	8 – 9
36^s	3.75 – 5	5 – 6	6.5 - 7.5
40^s	3.25 – 4.25	4.25 – 5.25	5.5 - 6.5
44^s	-	-	4.5 - 5.5
52^s	2.25 – 3	-	-
60^s	1.5 – 2.25	2.5-3-	3 - 3.5
65^s	1.25 - 2.0	-	2.25 – 3
70^s	1.1 – 1.8	-	-
80^s	1.2 -1.7	-	-
100^s	0.9 -1.2	-	-

Note1: - These ranges may cover about 70% of spinning units in Pakistan.

Note 2:- Upper limits of production in column 1 & 2 are from imported cotton, using "A" grade machinery, making Combed & Knitted yarns while lower limits are from low quality Pakistani cotton, making Carded yarns for Weaving purpose.

Note 3:- Counts finer than 60s are usually produced from imported cotton.

Note 4:- If spindle speed is 17000 rpm, TPI is 17.5 for 20s cotton knitting yarn & working efficiency is 93% then OPS will be 11.47.

Note 5:-Production capacity of a Spinning unit consisting of 17280 spindles using "A" grade machinery for 20^s cotton knitting Yarn can be as follows: -

Production per day in bags each of 100 Lbs = 11.5 / 16 x 3 x 17280 / 100 = 372.6

2.9 Consumption of Electricity for manufacturing of Ring spun yarn

2.9.1 Factors determining electricity consumption

- Count of yarn
- Type of yarn i.e. Carded or Combed, warp or hosiery, pure or blended yarn.
- Type and quality of raw material e.g. Pakistani or imported cotton, mixing of recycled waste.
- Make, model & condition of spinning machinery including recycling machine
- No. of beating machine in Blow Room.
- Passages of Drawing Frame
- Make, model & Air conditioner plant.
- Type of waste collection systems.
- Condition of electrical motors.
- Efficiency of electrical stop motions on various spinning machines.
- Machine lift, diameters & condition of Ring, type, condition and weight of travelers, and type and condition of spindle bearing on the Ring spinning frame.

2.9.2 There are great variations in the units consumed because of huge number of above mentioned variables and running of so many yarn counts along with their frequent changes. Therefore, it is difficult to give an accurate figure. The units (kilo watt hour) per Kg. for 20s carded yarn from Pakistani cotton spun on normal spinning machine may range from approximately 2.4 – 2.7.

2.10 Approximate Normal Spinning Yields

2.10.1 Carded yarn

		(Reported by IOCO)
From Pakistani Cotton	80-84 %	(82 – 86%)
From Imported Cotton	89-93 %	(92- 93%)

Note:- yield from exceptionally good quality cotton, using special machinery & after recycling various Spinning wastes, can be more than upper limits while in case of poor cotton using poor machinery, it may be less than the lower limits.

2.10.2 . Combed yarn

From Pakistani Cotton	63-68 %
From Imported Cotton	74-80 %

2.10.3 Man-made Short Staple Fibre yarn

Polyester, viscose and acrylic or their mutual blends i.e. PV, AP, etc.	96.5-98 %

2.10.4 Blended yarns

From man- made short staple fibres with cotton such as PC, AC etc.	Yields of both component may be taken separately depending on blend ratio

2.10.5 Approximate Invisible Losses

For cotton	1.5 - 3.5 %
For Polyester & Acrylic	0.5 -1.0 %
For Viscose	1.0 - 1.5 %

2.10.6 Factors Affecting Yield

- Type/Nature of fibre (Pure or Blends) e.g. cotton or man-made fibres.
- Quality of fibre used. Quality of imported cotton is better than Pakistani cotton, giving better yields.
- Quality of yarn to be manufactured.
  Combed yarn is spun with lesser yield.
- Make, Model and maintenance of spinning machines.
- Quality of process control
- Quality of air conditioning plant.
- Recycling soft wastes.
- Count of yarn.

2.11 Wastages in Spinning

Wastages occurs in spinning process in blow room in the shape of dropping and dust, in the carding section in the form of card dropping and card fly, in combing section in the shape of comber noil coupled with sweeping and pneumafil etc.

Approximate segregation of spinning waste for making Carded yarn from Pakistani cotton is as follows: -

Blow Room &Card	10 – 14 %	
Invisible	1.5 – 3 5%	
Hard waste	0.75 – 1.25 %	
Misc.	1.5 – 4 %	Consists of sweep, bonda, A/C etc.

The above wastages will over all remain in the range of 14-20% for Pakistani cotton. Moreover, these wastages are interdependent i.e. if blow room and card wastage is higher then other wastages will reduce accordingly and vice versa.

Most of these wastes are saleable but some are reuseable originally or after recycling (using willow & hard waste opening machine).

2.11.1 Explanations:-

- Dropping waste from Blow Room & Card (Taker- in/ licker-in) is a dirtier waste collected from under parts of beater rollers. (Dropping waste can never be used without recycling).
- Card fly is a cleaner waste collected from Flat / Cylinder region.
- Bonda is a clean waste collected from cleaner rollers of various drafting systems.
- Pneumafil is a clean waste collected from various machines by the help of air currents.
- Wastage of fibre occurs in spinning process in blow room in the form of dropping and dust, in the carding section in the shape of card dropping and card fly, in combing section in the form of comber noil coupled with pneumafil and sweeping etc.
- Comber noil is a clean waste collected from combing machines.

2.11.2 Process of Spinning waste Recycling for Cotton

2.11.2.1 Ist Process—cleaning

The first process is to recycle and clean these wastes separately before going into Spinning process. The recycling yields from Pakistani cotton are as under:

Table 2.13

Approximate yield ranges at Recycling & Cleaning Stage

Item	Yield	Invisible Loss
Blow-room Dropping	30 to 35%	7 to 14%
Lickerine (Card) Dropping	40 to 45%	6 to 10%
Ring Sweeping	40 to 70%	5 to 10%
Hard Waste	85 to 90%	4 to 8%

Source: Pakistan Open End Spinners Association.

2.11.2.2 2nd Process-Mixing

Re-cycled waste is mixed with a blend of low-grade cotton or comber noil or Pneumafil and polyester waste. The ratio of waste and cotton depends upon the factors like availability of any page of wastage, quality of cotton, count of yarn to be spun and quality of yarn to be spun.

2.11.2.3. 3rd Process-Spinning

Yarn is spun after mixing recycled waste into required ratio of raw cotton. The yield of yarn is as under.

Table 2.14
Yield at Waste Spinning Stage

Waste Mixing	Yield	Invisible Loss
100%waste	47 to 52%	5 to 7%
85 to 90%waste	53 to 58%	5 to 6%
70 to 85% waste	60 to 65%	3 to 6%
50 to 60% waste	70 to 75%	2 to 5%

Source: Pakistan Open End Spinners Association.

Note:- Wastages obtained at cleaning and spinning stage is not useable for yarn manufacturing

Table 2.15

Estimated yield % from doubling & twisting process

For cotton		**For polyester**	
Conventional Twisting	Two for one twisting	Conventional twisting	Two for one twisting
98% - 99%	99% -99.50%	99%- 99.50%	99.5% - 99.75%

2.12 Marketing Of Yarn

2.12.1 Besides direct supply to the users, a major portion of yarn manufactured by the spinning mills is marketed through the yarn market. The Yarn Merchants play an important role in the marketing/supply of yarn of spinning mills, as indicated below:

- Being investor, they also provide credit line to some spinners and also act as regular, safe and secure channel through which the spinner sells his yarn in the local market.
- They act as guarantors on behalf of the Spinning Mills as far as steady bulk supplies and quality of yarn is concerned. Similarly they also act as guaranters on behalf of purchasers of yarn for payments to the spinners.
- They provide a steady outlet to the products of the Spinning mills as major share of the yarn produced is used by the unorganized weaving sector, the major portion of which is un registered and need regular supplies but in very small quantities, at times on day to day basis due to paucity of funds. Such supplies cannot be obtained from spinning mills directly as the spinner cannot and does not deal with a large number of yarn purchasers in small quantities.

- The Yarn Merchants guide the spinning mills to change count of Yarn and blend of yarn as per requirements of the local as well as international market.
- After imposition of Sales Tax on Yarn, the role of yarn dealer has increased all the more because a dealer also provides an outlet to yarn invoices of the spinning mills in managing the arrangement of flying invoices.

2.12.2 Faisalabad Yarn Market is having about 60% share of yarn trading in the country. The data of registered wholesalers indicate that 25% yarn is traded in Lahore, 10% in Karachi and 5% in other areas. This data further indicates that the 84% of yarn supplied comprised of cotton yarn whereas the share of other yarn is 16% only.

Reportedly around 700 yarn merchants are working in the yarn market of Faisalabad, out of which only about 200 are the members of Pakistan Yarn Merchants Association, Faisalabad (but only 114 are registered with Sales Tax Collectorate Faisalabad, as yarn Wholesalers). This means that most of the yarn trading in the country is through unregistered dealers; not more than 15% of total production of yarn is supplied by the registered yarn merchants of the country declaring in the Sales Tax record. Broadly, there are two types of yarn merchants in the yarn market.

Broadly, there are two types of yarn merchants in the yarn market:

a) Those who, being investors, purchase yarn from the spinners against invoices in their own name, store the so purchased yarn in their own godowns and sell it to the individual buyers/weavers in smaller quantities as per prevailing market price but do not issue invoices in the name of such buyers. The merchants of this category registered with sales tax make supplies to the exporters as well as local users. They are following the below mentioned practices with regard to Sales tax:
    - Sales Tax on the commission of yarn merchant/wholesaler is paid by the spinner and the sale/purchase value of the spinner as well as the wholesaler remains the same;

- Some merchants make certain value addition on their purchase value and pay tax on this value addition after input adjustment through normal procedure; and
- Some people themselves pay the leviable tax on the amount of commission although their sale invoices do not show any value addition vis-à-vis the purchase invoices.

b) Those who work as contact person between the spinner and the buyer of yarn, negotiate the rate between the seller and the buyer and act as guarantor for supply of agreed quality/quantity of yarn from the spinner to the purchaser as well as payment from the purchaser to the spinner. In this arrangement the spinner despatches the yarn directly to the buyer designated by the yarn merchant and issues invoice as per his advice; the middle man gets agreed amount/percentage of commission from both the parties for providing service to them. These merchants are not registered with sales tax and predominantly they work for the unregistered weaving sector/manufacturers.

2.12.3 Flying Invoices

Normally the invoice is issued in the name of a buyer to whome goods are actually supplied. The term "flying Invoice" has been coined to describe the situation when invoice for a particular transaction is issued in the name of a registered person who has actually not bought the supply involved and is primarily interested in buying the invoice only to claim undue input tax adjustment or refund. In view of the fact that majority of the wholesalers/dealers of yarn, retailers of yarn, weaving units, dealers of intermediary inputs and wholesalers/retailers of grey cloth are not registered with the sales tax, their arises the need for flying invoice. The phenomenon got further strengthened when the requirement of continuous chain invoice was introduced in SRO 417(i)/2000 for the purpose of claiming refund of sales tax by the exporters. Following table indicates the flow of flying invoices.

Table 2.16

Flow Chart of Flying Invoices in yarn

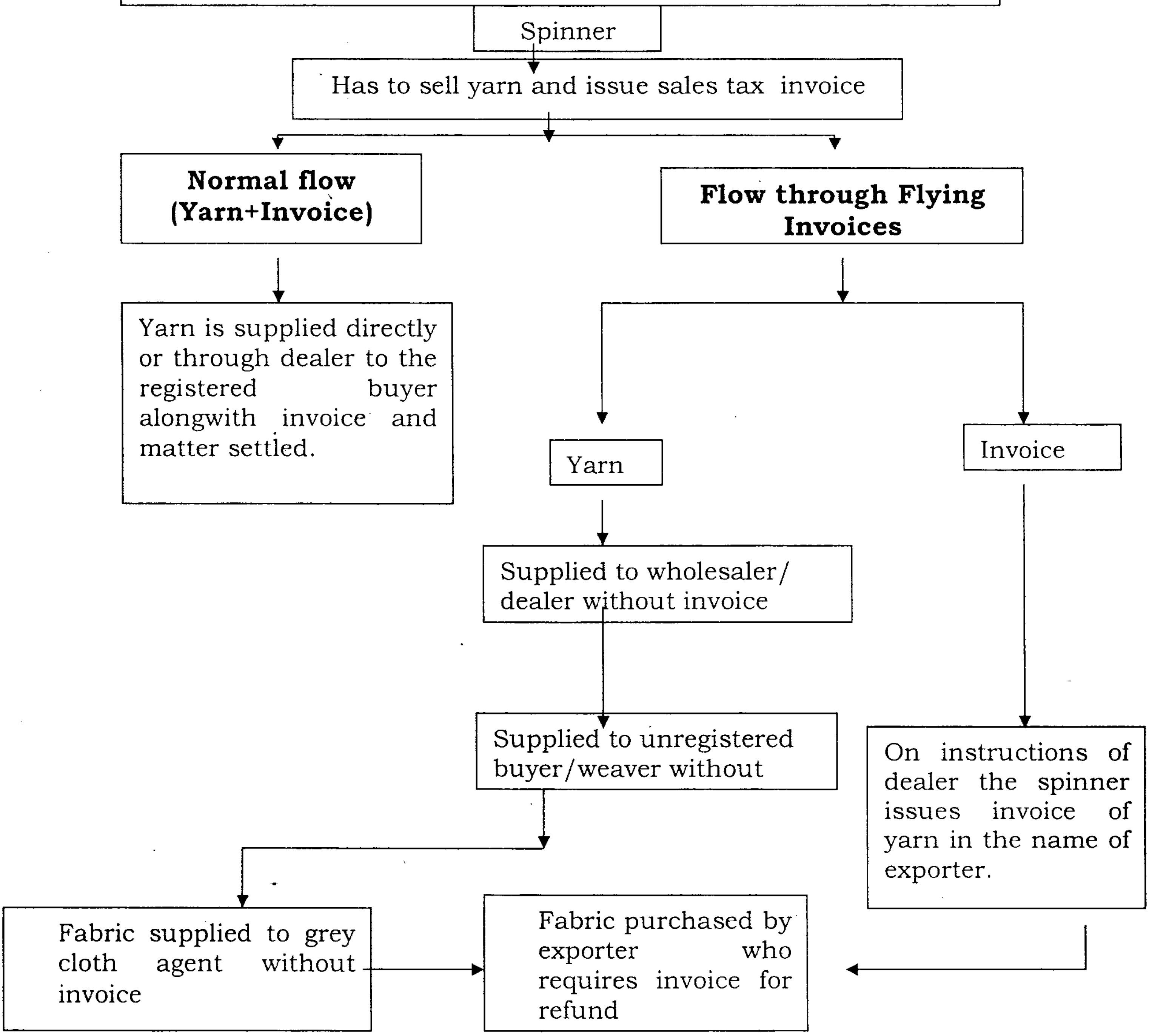


Table 2.17

Yarn Marketing by Registered Wholesalers in 2001

Total Yarn Sale	Rs. 21215 million
Cotton Yarn Sale	Rs. 17728 million (84% of total sale)
Other Yarn Sale	Rs. 3487 million (16% of total sale)

% Share of Cotton Yarn Sale by Registered Wholesalers

Faisalabad	60%
Lahore	25%
Karachi	10%
Others	5%

Table 2.18

Average Rates of Yarn in Faisalabad in June, 2002

(RATE PER LB)

100% COTTON YARN			PC YARN (35/65 QUALITY)		
Count	WEFT Yarn	Warp Yarn	Count	WEFT Yarn	Warp Yarn
7s/8s	17.5	20	10s	38	40
10s	20	30	15s/16s	42	43
14s	26	30	20s	51	
16s	28	32	24s	52	
20s	40	43	30s	44	48
22s	42	43	32s	45	48
24s	43	45	36s	44	55
26s	43	48	38s	45	55
28s	44	45			
30s	49	55			
32s	52	60			
36s	60	63	P.V Yarn		
40s	61	66	26	52-55	
52s	87	97	30	52-57	
60s	108	140	34	50-55	
80s	115	135	44	55-61	
			65	65-80	

Source: Yarn Market Faisalabad.

(Note: These rates illustrate the count-wise value difference; the rates can vary very frequently due to number of market factors).

2.13 Blend Ratio in Yarn

2.13.1 Generally the invoices issued by the spinning mills do indicate the count of yarn but do not give blend ratio of polyester and cotton; instead invoices indicate PC yarn or free ratio yarn (65:35, 70:30, 75:25), 100% cotton yarn, CVC (chief value cotton) yarn (45:55). However, certain mills do give blend ratio of yarn when so required by the buyer. The invoices indicating PC yarn (without specifying exact blend ratio) are also known as free ratio and such yarn has no guarantee of 100% exactness of blend ratio, as agreed. On the other hand 100% cotton yarn and CVC yarn is treated as guaranteed in respect of ratio.

2.13.2 Blend ratio of yarn/fabrics is always given by the exporters on export invoices and shipping bills because rates of duty drawback are linked with the blend ratio.

2.13.3 The blend ratio of polyester and cotton in the yarn generally depends, inter alia, upon the prevailing price of both of these fibers; the ratio of polyester is increased if it is available on cheaper price and its ratio gets decreased if its price is on the higher side in the market. It is a fact that due to price factor, generally variation in blend ratio do exist in PC yarn, as against the declared/agreed ratio. However, it is also a fact that no such variation is found in the yarn of certain renowned and good reputed spinning mills.

2.13.4 In majority of cases actual blend ratio varies from the declared/agreed ratio of yarn at the time of laboratory test. But this variation is generally not more than 5%, though this ratio may increase abnormally in certain cases of exceptional nature.

2.13.5 Customs duty drawback rates on export of blended yarn/fabric are based on the blend percentage. Customs SRO 412(i)/2001, as amended by SRO 269(i)/2002 dated 13.5.2002, allows different rates of duty drawback on polyester cotton blended yarn of different fixed blends without any blend range. (Schedule VI). However, repayment on blended fabrics is admissible on the range of blend. As such determination of blend ratio of such exported goods is invariably made through laboratory test. The general trend of such laboratory tests indicates that the variation in declared blend ratio is not more than 4-5% than the declared one (view of Customs laboratory, Faisalabad).

2.13.6 Generally no variation takes place in the blend of yarn in the weaving process. The blend ratio, if varied in the sizing process due to application of sizing material, will revert back to its normal ratio in the process of de-sizing and scouring which is required to be done for bleaching, dying and printing of fabric.

2.14 Issues Relating To Sales Tax

Yarn manufactured from undocumented cotton ("Gol Mall") finds way in the market without declaration in Sales Tax record to meet the requirement of unregistered loom sector.

There is a possibility that a spinning mill has procured cotton from a ginner without payment of Sales Tax but at the same time has claimed input tax/refund on the non tax paid purchase invoice.

Spinners have to procure cotton lint during the ginning season to meet their total yearly requirement. Hectic buying leads to huge input tax adjustments. The revenue from the sector remains negligible during the ginning season.

2.14.4 The wastages obtained during the spinning process is of different types and has different values. This waste is sometimes grossly under invoiced.

2.14.5 It is a possibility that pneumafil and cardfly waste obtained during manufacture of yarn is used by the same mills for the manufacture of local quality course count yarn and the same is supplied without accounting for in the sales tax supply register and without payment of sales tax.

2.15.6 The Spinning Industry Rules, 1999 under SRO923(i)/99 dated 16.08.1999 require, interalia, that yarn shall be removed from the registered spinning units to the buyer against a "Delivery Note" which should contain the Sales Tax invoice number and date. This should accompany the consignment of yarn. These Rules are not actually followed as sizeable quantity of yarn gets delivered against flying invoices, where the yarn consignment and its invoice take two different routes and reach to different persons. This phenomena is detrimental to Govt. revenue and documentation.

2.14.7 Yield of different wastes varies enormously and no hard and fast rule can be adopted at the time of audit to ascertain the actual yield except to depend upon the declared yield by the manufacturer.

2.14.8 Most of the open end units are un-registered and installed in residential areas where cotton waste is processed. It is easy to stop production when the rates of processed wastage shoot up or when the supply rates of open end yarns fall down. The un-even production provides an edge to the manufacturer to grossly under-declare production or not to declare production at all.

2.14.9 Counts like 4/s and 6/s produced by using cotton waste are used for making ropes etc. which yield no revenue due to non registration. Almost all the rope manufacturers are in the undocumented sector which makes it impossible to locate the manufacturers of yarn of supply side.

2.14.10 Counts like 10/s and 12/s are used for making local quality or low quality tents and towels for local use. The unorganized loom sector manufacturing canvas/fabric for these tow industries is also un-registered and thus making it difficult for the department to reach to the open end units or ascertain their production.

2.14.11 Electricity, spares. Paper cones and PP bags are also important inputs of spinning mills on which input tax adjustment is also claimed.

2.14.12 Some spinning mills also claim input against diesel used in the generators installed for standby purposes, which is not admissible under SRO 578(i)/98..

2.15 Audit Guidelines

2.15.1 Check daily production reports (DPR) of the unit for one month on test basis to see if there are abnormally low production figures. Table 2.12 can be used as a reference.

2.15.2 What does the yield statement indicate; in case of abnormally lower yield, ascertain the reasons of higher wastage

2.15.3 Does the summary of month wise cotton purchase indicate the non payment of Sales Tax on Purchases.

2.15.4 Examine the summary of month wise cotton purchased and addl Tax on late Payment.

2.15.5 Get the list of unregistered buyers of yarn to whom yarn has been supplied by charging 3% further tax so as to determine the taxability of such persons.

2.15.6 Seldomnly carry out physical verification of Stocks of yarn and cotton lint and random checking of ginner names on the bales in stock with the available Invoices.

2.15.7 Ascertain the inadmissible Input adjustments in violation of SRO 578(i)/98.

2.15.8 Is the unit following the procedure of Ginning Industry Rules and DTRE Rules.

2.15.9 Ascertain whether the unit is following the requirements of Special Procedure for Spinning Industry Rules, 1999.

2.15.10 Declared supplies of yarn to be rechecked with PP bags and paper cones purchased (one bag weighs 100Lbs and normally contains 40 cones of yarn).

2.15.11 The aspect of non payment of Sales tax on supplies of waste & bailing hoops.

2.15.12 Non payment of Sales Tax on disposal of fixed assets.

2.15.13 Check up month wise summary of waste supplied with value and weight of each type of waste indicating the complete particulars of the waste dealer so as to ascertaining the turn over of such dealer.

SPINNING

Summary of Important Information

1. Formula for Yarn Production

Total yarn production in lbs/day OPS/16 × 3×No. of spindles

OPS (ounces per spindle per shift)

2. Approximate Ranges of Production in O.P.S.

Yarn Counts (Ne)	From Raw Cotton	From PC blends (50-50)	From man made fibers and their blends
10^s	19 - 23	22 – 26	-
16^s	12.5 – 14	14 – 17	-
20^s	9.25 – 11.5	11.5 - 13.5	12.5 -14.5
24^s	6.5 – 8.5	8.5 - 10.5	9.5 – 11.5
30^s	5 – 6.5	7 – 8	8 – 9
36^s	3.75 – 5	5 – 6	6.5 - 7.5
40^s	3.25 – 4.25	4.25 – 5.25	5.5 - 6.5
44^s	-	-	4.5 - 5.5
52^s	2.25 – 3	-	-
60^s	1.5 – 2.25	2.5-3-	3 - 3.5
65^s	1.25 - 2.0	-	2.25 – 3
70^s	1.1 – 1.8	-	-
80^s	1.2 -1.7	-	-
100^s	0.9 -1.2	-	-

3. System of Count (Ne)

The standard for the yarn count in cotton is one pound of fiber drawn out to make 840 yards of yarn; the resultant thickness or size is known as count number 1, or 1s or 1i, or Ne 1. If the yarn is drawn out farther, so that one pound makes twice 840 yards, it is identified as Ne 2 or 2s or 2ı. Thus, Ne 2 yarn will be finer than Ne 1. The higher the numbr of the yarn count, the finer the yarn in size. Yarn counts up to Ne 20 are called coarse yarns; Ne 20-34 are medium yarns; Ne 36-47 are fine yarn; Ne 48 and above are super fine yarn.

4. Count-Wise usages of spun yarns

Count (N_{e+})	Usage
6 -12	Rugs, mats, Industrial ropes, canvas, towels, tents, Niwar etc.
12-22	Towels, Hand bags, curtain & table cloth, bed sheets, etc.
22-32	Sports wear, upholstery, latha, poplin, sheeting, suiting cloth etc.,
32-60	Cambric, sheeting, lawn, high quality suiting, etc.
60-100	Fine sheeting, fine suiting, voil & lawn etc.

5. Approximate Normal Spinning Yields

(i) Carded yarn

		(Reported by IOCO)
From Pakistani Cotton	**(82 – 86%)**	**80-84 %**
From Imported Cotton	89-93 %	(92- 93%)

(ii) Combed yarn

From Pakistani Cotton 63-68 %

From Imported Cotton 74-80 %

(iii) Man-made Fibre yarn

Polyester, viscose and acrylic 96.5-98 %
or their mutual blends i.e. PV, AP, etc.

(iv) Blended yarn

From man- made fibres with cotton such as PC, AC etc.	Yields of both component may be taken separately depending on blend ratio

(v) Approximate Invisible Losses

For cotton	1.5 - 3.5 %
For Polyester & Acrylic	0.5 -1.0 %
For Viscose	1.0 - 1.5 %

6. Wastages in Spinning

Blow Room &Card	10 – 14 %
Invisible	1.5 – 3 5%
Hard waste	0.75 – 1.25 %
Misc.	1.5 – 4 %

(Overall range 20-24%)

7. Spinning waste Re-cycling for Cotton

Yield at Recycling & Cleaning Stage

Item	Yield	Invisible Loss
Blow-room Dropping	30 to 35%	7 to 14%
Lickerine (Card) Dropping	40 to 45%	6 to 10%
Ring Sweeping	40 to 70%	5 to 10%
Hard Waste	85 to 90%	4 to 8%

Yield at Waste Spinning Stage

Waste Mixing	Yield	Invisible Loss
100%waste	47 to 52%	5 to 7%
85 to 90%waste	53 to 58%	5 to 6%
70 to 85% waste	60 to 65%	3 to 6%
50 to 60% waste	70 to 75%	2 to 5%

8. Estimated yield % from doubling & twisting process

For cotton		For polyester	
Conventional Twisting	Two for\ one twisting	Conventional twisting	Two for one twisting
98% - 99%	99% -99.50%	99%- 99.50%	99.5% - 99.75%

Chapter 3
WEAVING

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Chapter 3

Weaving

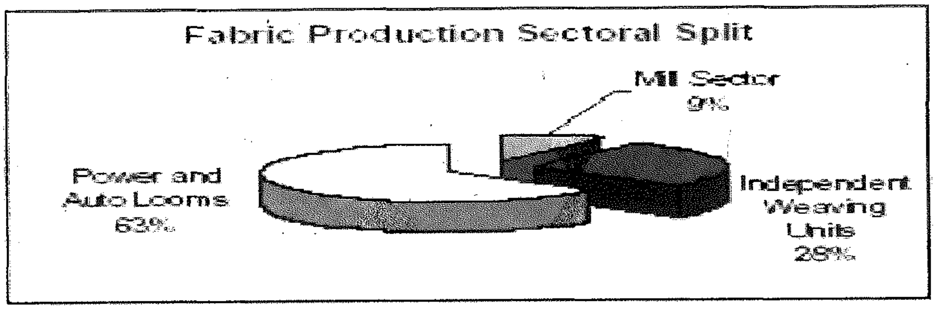
3.1 Introduction

In 1947, there were only two textile mills in Pakistan-one at Okara and the other at Faisalabad. These were composite units having all the departments such as ginning, spinning, weaving, bleaching, dyeing and printing. By mid-sixties there were about 180 units of textiles spinning weaving and processing, about 31,000 looms since 1969-70 continued to operate in the mill sector even after general segregation of weaving. This number decreased to only 9,000 looms by the end of June 2000.

3.1.1 Weaving Classification

The weaving industry in Pakistan can be broadly classified into three main segments:

- Composite Weaving Units
- Independent Shuttleless Weaving Units
- The Powerloom sector



Source: SMEDA

3.1.1.1 Composite Weaving Units (Mill Sector)

The composite weaving units comprise of integrated textile mills having their own spinning and dyeing facility. A total of fifty such units currently exist. The installed capacity of these units is 14100 looms, which also includes the old auto and power looms. The working number of looms in the sector is 9981. The production of cloth by these units in 2000-2001 was 490 million sq.m.

3.1.1.2 Independent Shuttleless Weaving Units

The number of such units in the country is more than 300. All of these units are equipped with shuttle-less weaving technologies, dominated by the Sulzer projectile looms, which constitutes almost 70% of the equipment installed in the sector. The working number of looms in the sector is approximately 14,500, out of which 5,500 looms are second hand. The rest of the 9,000 looms in the sector include Sulzer projectile looms and rapier looms manufactured by the Sulzer and other Japanese manufacturers including Tsudakoma, Toyoda and Picanol. Modern units in the sector have also inducted new Air-jet looms. The total number of Air-jet looms in both the mill sector and the shuttle less sector is around 3,000. The total fabric production capacity of this industrial segment is around 1.2 billion sqm, which is 28% of the total fabric produced in the country. It can be safely assumed that this sector accounts for more than 40% of the total fabric exports, majority of which comprise of greige fabric.

3.1.2.3 Powerloom Sector

The power loom sector of Pakistan dominates the fabric production in the country. The manufacturers from this segment are clustered in the city of Faisalabad. Number of looms in each firm varies from 4 to more than 50. This sector accounts for 63% of the total production of fabric. The installed capacity of the power auto looms is around 213400. The estimated working number of machines is not more than 180,000, which also includes 20,000 auto looms. The total fabric producing capacity of these looms is estimated to be 2.8 billion sqm. This segment accounts for more than 50% of the fabric exports.

3.1.1.4 Artificial and Synthetic Fabric Looms

Another segment represents power looms, which produce synthetic and artificial fabric. Currently an estimated number of 80,000 looms are associated with the production of synthetic fabric. Out of these only 40,000 are operational. More than 800 million sqm of fabric is produced annually by this sector. Instead of cotton and blended yarns, these looms manufacture fabric by using artificial filament yarn such as polyester, nylon, acrylic, etc.

Table-3.1

Looms distribution by Sub-sector

Sub-sector	Nos. of Looms Installed	% Share
Cotton Textile	242,000	71%
Synthetic Textiles	80,000	23.5
Canvas	7,602	2.2
Terry Towels	7,602	2.2
Woolen	1,144	0.3
Jute	2.200	0.6
Total	340,548	100

Source: Textile Commissioner Office
Pakistan Textile Journal-October 2001

Table- 3.2

Shuttle-less-looms Capacity by Insertion system

Weft Insertion System	Nos. of Looms	% Share
Projectile	10,200	63
Air jet	4,033	25
Rapier	1,307	8
Water Jet	600	4
Total	16,140	100

Source: Textile Commissioner Office
Pakistan Textile Journal-October 2001

3.2 What is weaving

Weaving is a textile process in which yarn is converted into fabric by interlacing two sets of yarn, warp and weft, at right angle to each other.

3.2.1 Warp – This is the group of yarns that run parallel to selvedge along the length of fabric. Warp is also referred to as **TANA** in local language. A single thread of warp is known as **End**. The local term used for End is **Tar**. This is measured as ends per inch. Sometime word **REED** is used for number of ends per inch.

3.2.2 Weft – This is the group of yarn that runs across the width of the fabric- at right angle to the selvedge or Warp ends. In local language it is also called **BANA**. A single thread of weft is known as a **Pick.** Weft is inserted by using a shuttle on conventional looms while on shuttle-less looms different weft insertion system are available.

3.3 Weaving Processes

The following processes are involved in the conversion of yarn into fabric.

- Winding
- Warping
- Sizing
- Looming
- Knotting
- Weaving
- Inspection / Mending
- Folding/Packing

3.3.1 Winding

Objectives:

- The purpose of winding is to transfer yarn from one package to another package that is suitable for the next process.
- To produce bigger package of yarn from small packages and vice versa.
- Remove yarn faults such as thick and thin places

3.3.1.1 Types of winding Machines

Following types of winding machines are used in the industry.

- Cone/Cheese winding machine
- Auto Coner
- Pirn winding machine

3.3.1.2 Cone/Cheese Winding Machine

This machine is used for winding bigger packages of yarn from baby cones or **Gullas.** Mostly locally made machines are used. Although some old imported machines are also in operation. The production of winding machine depends on;

- ➢ The number of spindle, winding head or drum per machine
- ➢ Winding speed
- ➢ Yarn type and quality
- ➢ Worker efficiency

Winding speed of these machines normally ranges between 300-700 meters per minute. The number of winding heads may vary from 10 to50.

3.3.1.3 Auto-coner

These are high-speed modern winding machines, which are invariably imported.
Both spinning and weaving mills are using these winding machines. These machines are fully automatic and repair the yarn breaks through splicing. The factors affecting the production are almost same as given above plus the efficiency of the splicing (knotting) mechanism.

The winding head may vary between 10-50 and the winding speed between 800-1200 meters per minute.

3.3.1.4 Pirn Winder

Pirn winding machine is used only in shuttle loom sector. Its purpose is to wind small package of yarn, known as "Pirn" or "Nalki" that fits in the shuttle. Mostly local made machines are used, however some second hand imported machines are also in operation.

The spindle speed of these machines may vary between 4000-12000 rpm. and the number of spindles per machine may range from 12-50. The production depends upon:

- Yarn count and type
- Spindle speed
- Number of winding heads
- Efficiency of winder
- Machine type automatic or manual

3.3.2. Warping

This process involves transferring or winding of yarn from individual packages (cheese or cones) onto a beam that is suitable for further processing.

Objectives:

- Transfer yarn from cheese or cones onto a beam
- To assemble the required number of ends on to a beam
- To arrange dyed yarn according to a particular pattern
- To produce a warp beam which can go either to loom or to sizing machine.
- To prepare a warp of required length.

3.3.2.1 Types Of Warping Machine

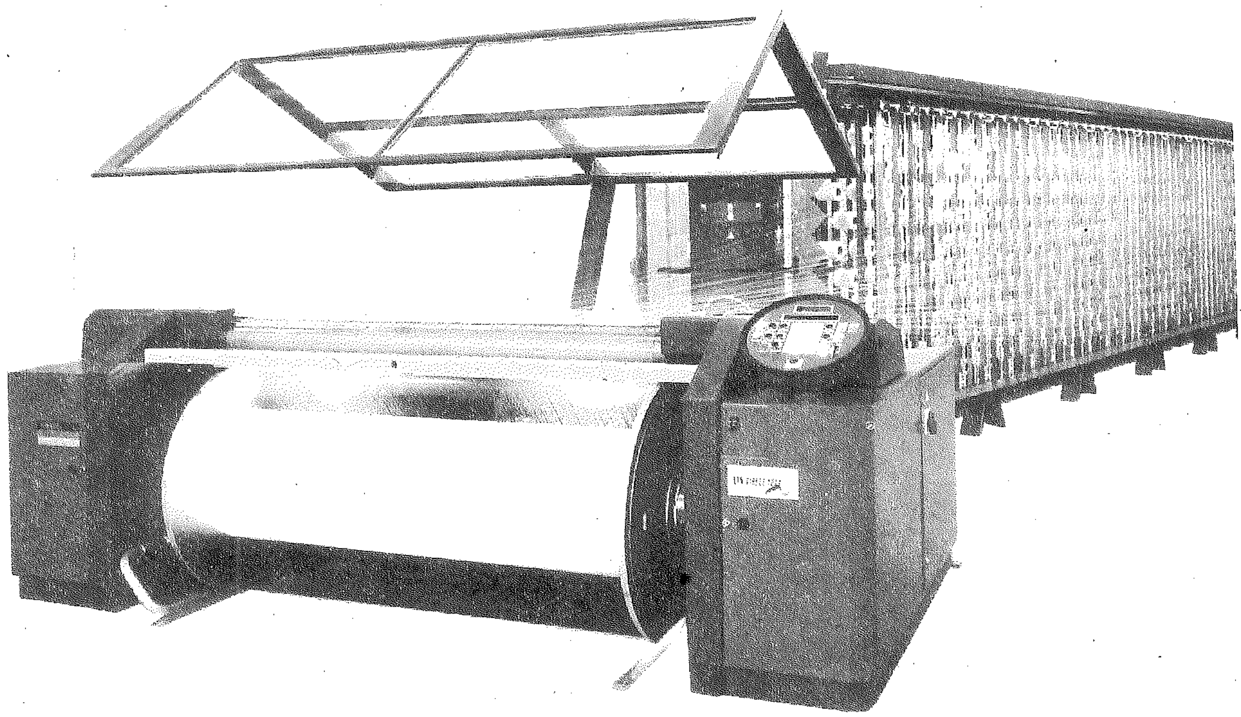
Generally there are three types of warping machines used in industry. The make and design of individual machine may vary but all of them fall under these three categories.

3.3.2.2 High Speed Warping

These are rather simple machines. Both locally made and imported models are being used. This machine consists of mainly two sections.

- **Creel** – a frame work where the cones are placed during warping
- **Head Stock**. Where the beam is placed. It has a driving mechanism and control system.

The speed of modern winding machine can be 1200 m/min, whereas ordinary warping machine speeds range between 400-800 m/min.



Warping Machine

3.3.2.3 Sectional Warping

These machines are used where warp patterning is involved or small quantity of fabric needs to be produced. This is relatively slower process as compared to high speed warping.

The speed may be between 200-400 m/min on ordinary local machines and up to 600 m/min on newer machines.

3.3.2.4 Ball Warping

This type of warping is only used where warp is to be dyed in rope form. It is mainly used in Denim plants. Its speed may vary from 400 to 600.

3.4 Sizing

Sizing is textile process in which size, a thick solution of adhesives –mainly carbohydrates, synthetic binders and lubricants- is applied to warp yarn before weaving.

3.4.1 Sizing Materials

- Starch is added to impart strength. Maiz starch and rice starch are used for this purpose. Rice Starch is cheaper than manz starch.
- Polyvinyl Alcohol (P.V.A).
    - It is a film former and imparts more strength to yarn.
    - It is an adhensive agent and avoids hairiness.
    - It is also a binder.

- Wetting agent
- Some wetting agents are also added to make the yarn receptive to take up size easily.
- Antiseptic
- Some times some antiseptics are also added to avoid fungus and mildew attack. (if the yarn is to be stored for sometimes, antiseptic must be used).
- C.M.C (Carboxyl methyl cellulose)
- It is a strong binder and it gives maximum stickiness.
- Muton tallow
- Paraffin wax
- Protein binder e.g. suresh
- Detergent as a wetting agent
- China clay

3.4.2 Objectives

- To strengthen yarn so that it would withstand the tensions applied in weaving.
- to coat the yarn with a protective coating so that it will with stand the abrasion during weaving
- To improve the weave-ability of yarn & hence the efficiency in weaving.
- To increase fabrics weight by adding weighting material such china clay.

3.4.3 Factors for use of sizing material

The type and quality of Sizing material to be used depend on the following of factors

- Yarn count & type of yarn
- Nos of Ends & picks per inch in fabric
- Fabric weave or design
- Weaving machine type, operational speed etc.
- Cost/price of sizing material
- Customer requirements i.e. some customer prohibit the use of PVA.
- Fabric cover factor

3.4.4 Sizing Recipe

There are no hard and fast rules, as to which material is used and in what quantity. Generally PVA is invariably used for P/C blends. Course cotton count don't need PVA in low cover factor fabric. Finer cotton as well as P/C yarns do need some proportion of PVA. CMC is used for polyester yarns only.

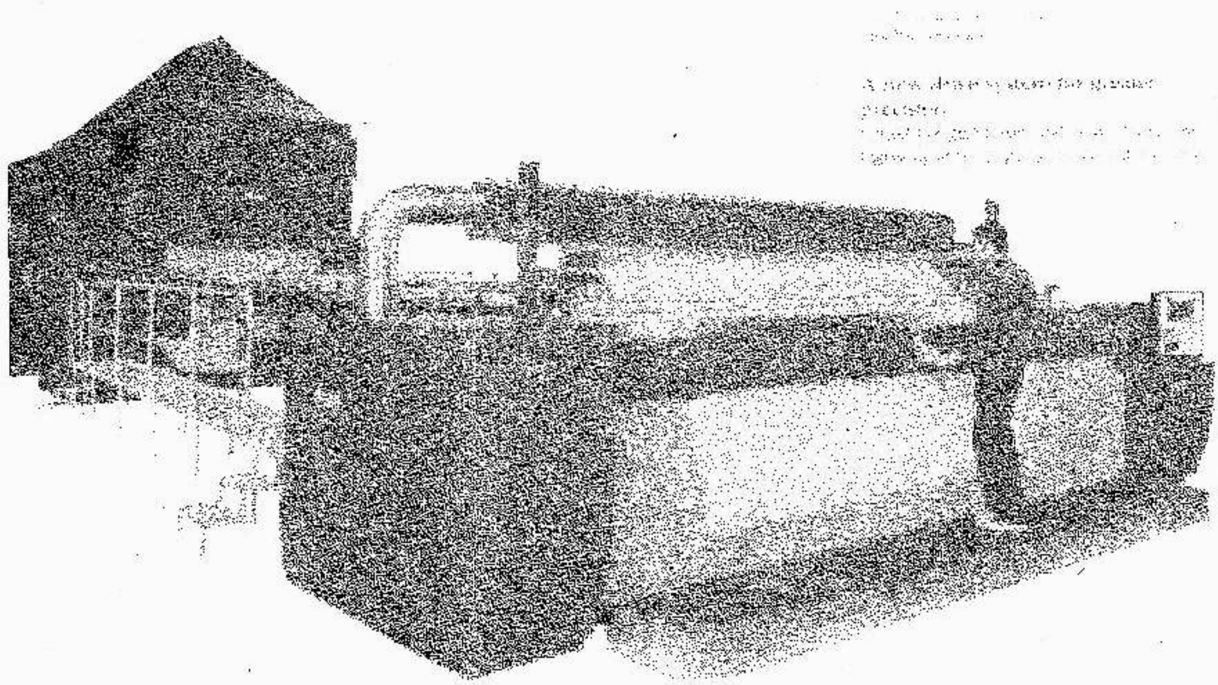
Maiz starch and rice power are alternatively used but cost of rice powder is comparatively low. Current rate of PVA, maiz starch, rice powder and tallow are Rs. 125/kg, Rs 20/kg, Rs 12/kg and Rs 11/kg respectively.

3.4.5 Sizing Machine Types

There are three types of sizing machines

- Slasher sizing or Tape Sizing machine
- Single End Sizing machine
- Hank sizing machine

N. B. Slasher sizing machine is the most commonly used machine in the weaving industry and only this machine will be discussed here.



Sizing Machine

3.4.5.1 Slasher Sizing Machine

This machine consists of the following sections;

- **Creel Section** – a metal framework that holds the beams of un-sized yarn during the sizing process.
- **Size Box or Sow Box** – This is a very important part of size machine as the size liquor/paste is applied to the yarn in the size box. The yarn sheet is first dipped into the size liquor and then squeezed between rollers in order to remove the extra size.
- **Drying Section** – this section consists of a number of cylinders, also referred to as cans. These are heated by steam and are used to dry the sized yarn. The number of cylinder affect the rate of drying and hence the machine speed and rate of production. Number of cylinder may vary from 4 –12.
- **Splitting or Leasing Section** – this section comes after drying section. The ends sized yarn coming out of drying section stick together and must be separated from each other. This is done in the leasing section by the use of lease rods.
- **Head Stock** – all the driving mechanisms, such as motors and gearbox and control equipment are housed in the headstock. The sized yarn is wound onto a weaver beam in this section.

3.4.6 Value Addition by Sizing

Only warp yarn is required to be sized in fabric weaving. Even no sizing is required in canvas weaving. The sizing rates are charged on Kg/Lb yarn basis. If average width of fabric is taken as 63" with varying qualities of fabric, the value addition by sizing works out to 8.5%. This value is subject to change on account of changing sizing charges as well as market value of yarn. As an example, the following table elaborates the element of value addition by sizing on different qualities of yarn/fabric.

Table 3.3
Value addition by Sizing

Fabric Quality	Fabric Width	Rate of Yarn LBS	Warp Yarn Weight (LBS)	Warp yarn value per meter	Sizing Rate KGS/LBS	Sizing Cost Per meter Per K.g.	Value of Sized yarn LBS/Yard	% Value addition by sizing
76x56 35x35 Pc	63''	54	0.187	10.09	09/4.08	0.76 9.41	58.08 10.85	7.55%
76x56 30x30 Pc	63''	50	0.218	10.90	09/4.08	0.89 9.44	54.08 11.79	8.16%
60x60 20x20 ©	63''	46	0.258	11.86	8.362	0.93 8.33	49.62 12.79	7.86%
96x76 35x35 Pc	63''	56	0.236	13.21	14/6.35	1.50 14.70	62.35 14.71	11.33%
76x68 30x30 Pc	63''	50	0.218	10.90	10/4.53	0.98 10.40	54.53 11.88	9.08%
100x80 40x40 Pc	63''	65	0.215	13.98	16/7.25	1.55 16.66	72.25 15.53	11.15%
44x40 16x16 Pc	63''	40	0.236	9.44	7/3.17	0.75 7.33	43.17 10.19	7.92%
44x40 16x16 Pc	63''	36	0.378	13.60	6/2.72	1.03 10.07	38.72 14.63	7.55%
60x60 60x60 C	63''	109	0.086	9.37	16/7.25	0.62 16.66	116.25 9.99	6.65%
76x76 80x80 C	63''	135	0.081	10.93	22/9.98	0.80 22.63	144.98 11.73	7.39%

Source: All Pakistan Cotton Powerlooms Association

Average value addition to Total Fabric 18%

Average Value addition in Sizing 8%

Note:

- yarn + sizing rates are those prevalent in September 2002.
- These are average rates and can vary due to different market factors.
- These rates are for shuttle weaving. Rates for Shuttle Weaving may be more by 15-20%.
- The sizing cost per KG will increase with the increase of fabric width because of increased weight of yarn.

Table 3.3.1
Average Consumption Sizing Material

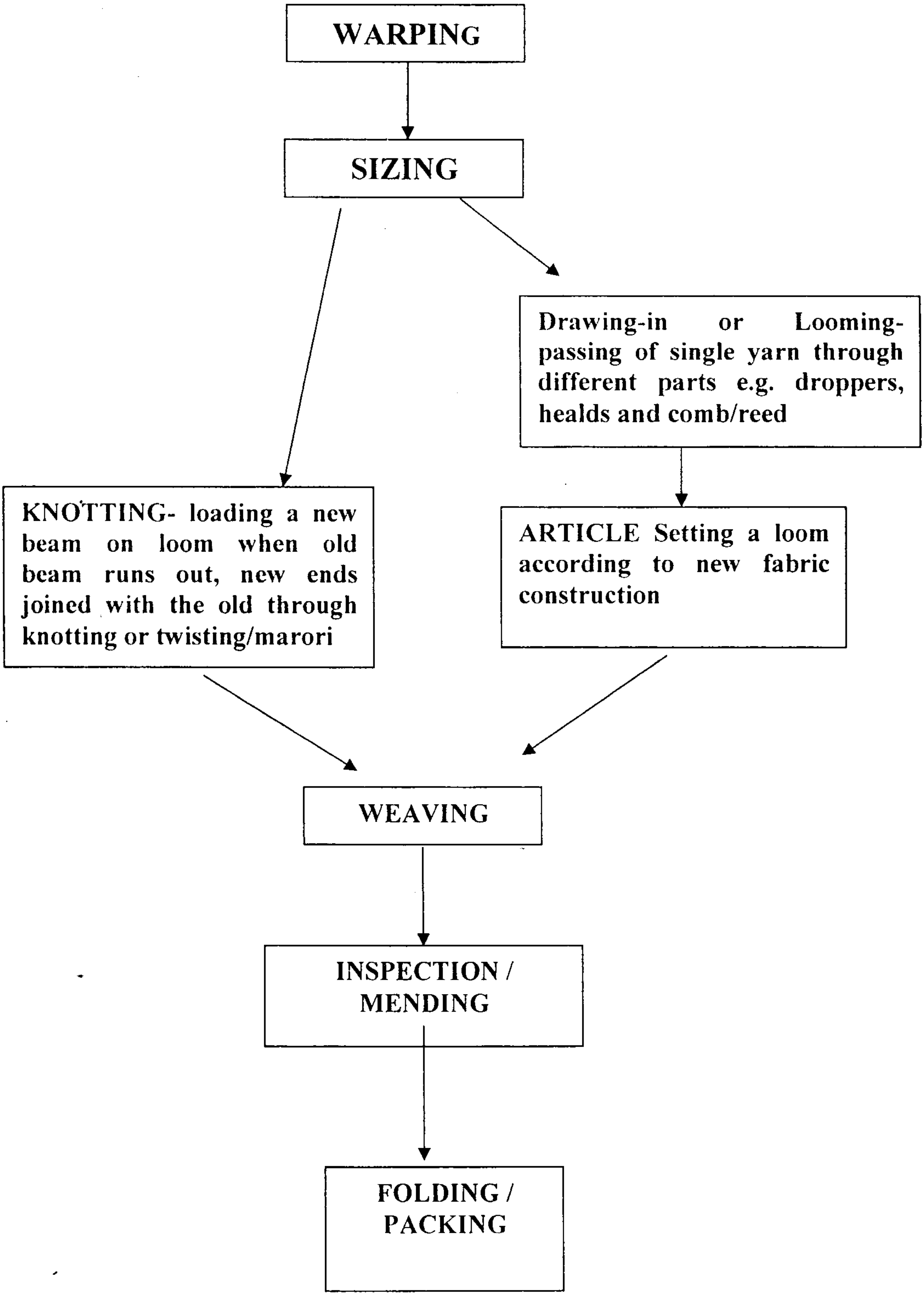
Width in Inches	Avg. Warp Yarn Count	Avg. %age of				%age of Sizing Chemicals by Weight of Yarn
		PVA	Starch	ACC.	Tallow	
47	16	5	67	20%	8%	20%
63	19	6	65	21	8	15%
67	24	7	66	20	7	22%
68	14	0	67	25	8	14%
80	24	3	66	23	8	16%
100	38	9	62	22	7	28%
102	30	8	65	21	6	13%
112	21	0	63	27	10	8%
114	30	7	66	21	7	12%
Average	24	5	65	22	8	16.44%

Table 3.3.2
Sizing Charges

Quality	Ends	Rate/Kg
7Pc	4228	13.5
10Pc	4525	13.5
24Pc	4540	13.5
38Pc	3736	16
7/s Cotton	2492	7.7
10/s Cotton	2324	11
16/s Cotton	2950	11
20/s Cotton	6760	14
24/s Cotton	4212	11
30/s Cotton	7400	18

Note: Sizing is done only for Warp yarn

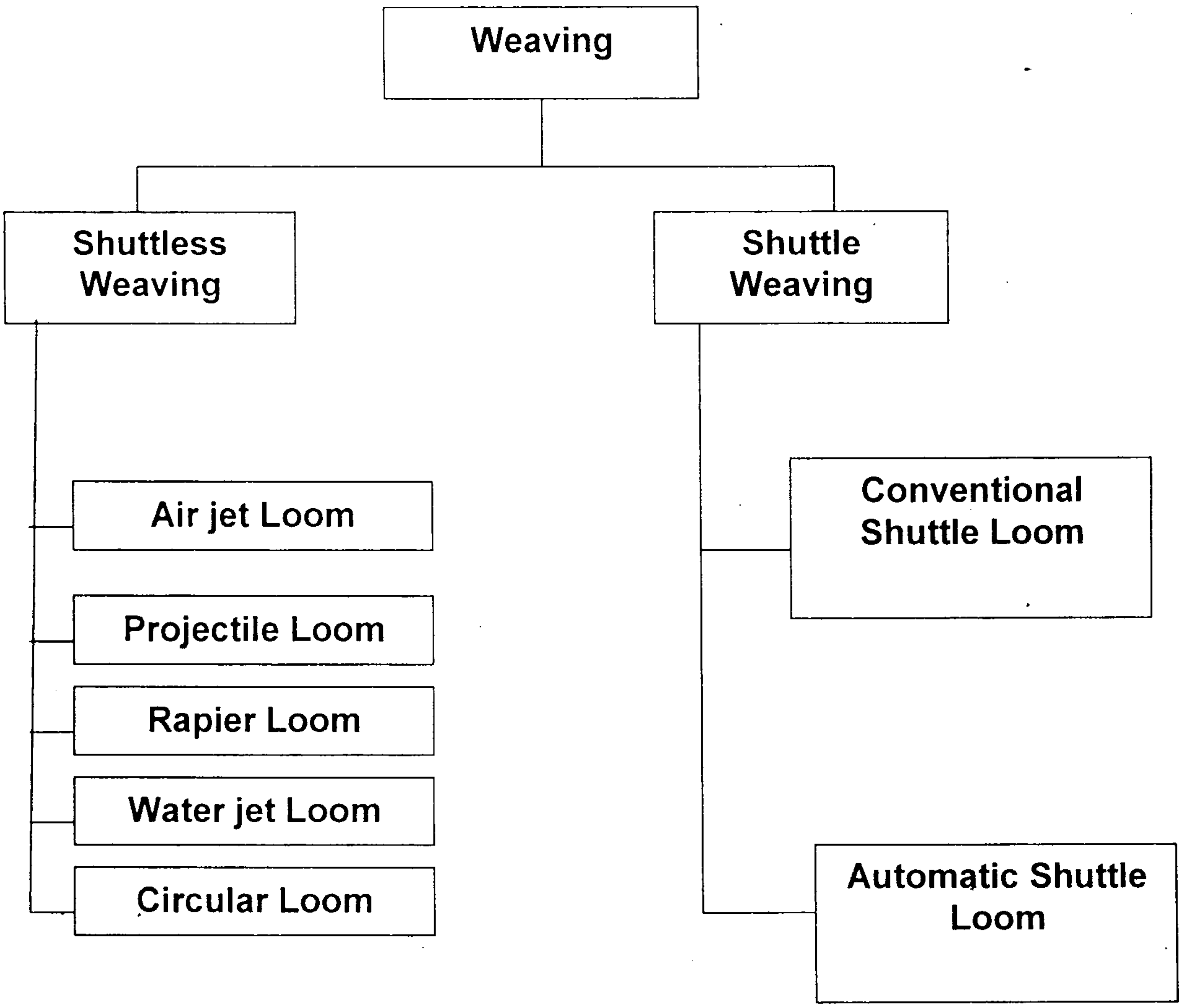
Flow-Chart of Weaving Process



3.4.6 Weaving

In weaving process interlacing of warp and weft yarn takes place to form a fabric. The warp yarn is taken from weaver's beam that is placed behind the loom and weft yarn is supplied by a shuttle or cone. Different types of looms are used to weave fabric. The weaving industry can be divided into different sub sectors according to the types of loom it uses.

Classification of Weaving Machines



3.4.6.1 Shuttle Weaving

Mainly two types of shuttle looms are used in our shuttle loom sector.

3.4.6.1.1 Power Loom

This is the simplest type of shuttle loom that runs on power. These looms stop whenever pirn is exhausted, that is why these looms are less productive and are gradually phased out.

3.4.6.1.2 Auto Loom

This is also a shuttle loom but it is fitted with an automatic pirn change mechanism. That is, whenever a pirn runs out it is replaced with a full pirn without stopping the machine. This machine is becoming more popular in shuttle sector and is preferred instead of simple power loom.

Table 3.4

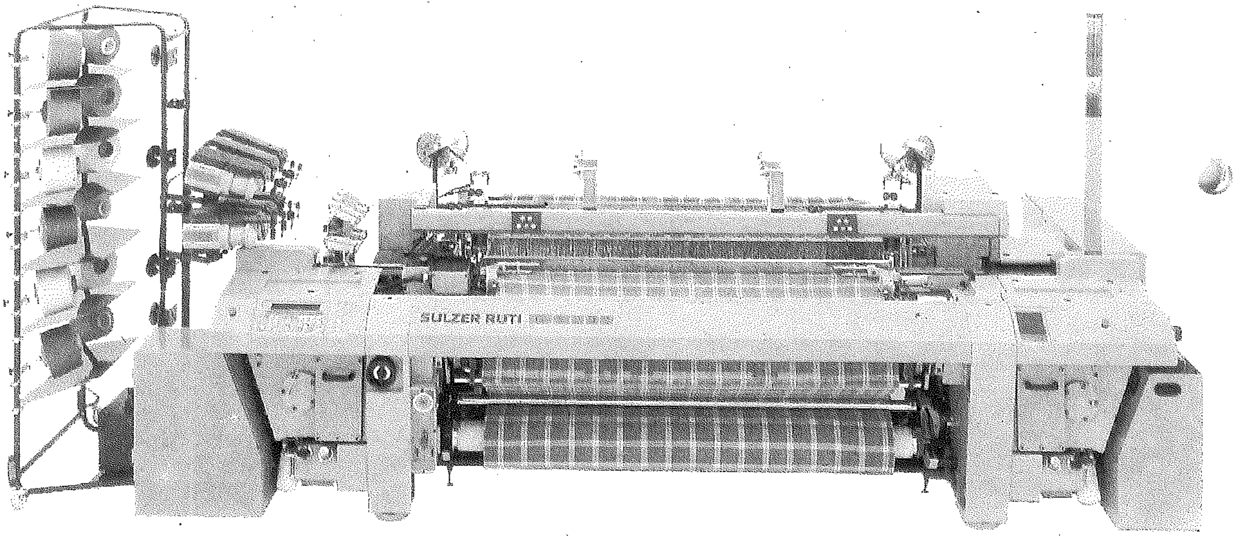
Shuttle Loom Common Operating Particulars

Loom Size	56 inch	76 inch	85 inch	105 inch	120 inch
Speed rpm	160	140	124	115	110
Production/h, for 60picks/inch	4.44yds	3.89yds	3.44yds	3.19yds	3.05yds
Motor	1 HP 950 rpm			1.5 HP, 750 rpm	

3.4.7 Shuttleless Weaving

3.4.7.1 Projectile Weaving

Projectile weaving is by far the biggest shuttle less loom sector. Function of the loom is same as shuttle loom i.e. to produce fabric. However, its production is higher and the fabric quality is much better than the conventional loom.



PROJECTILE WEAVING MACHINE

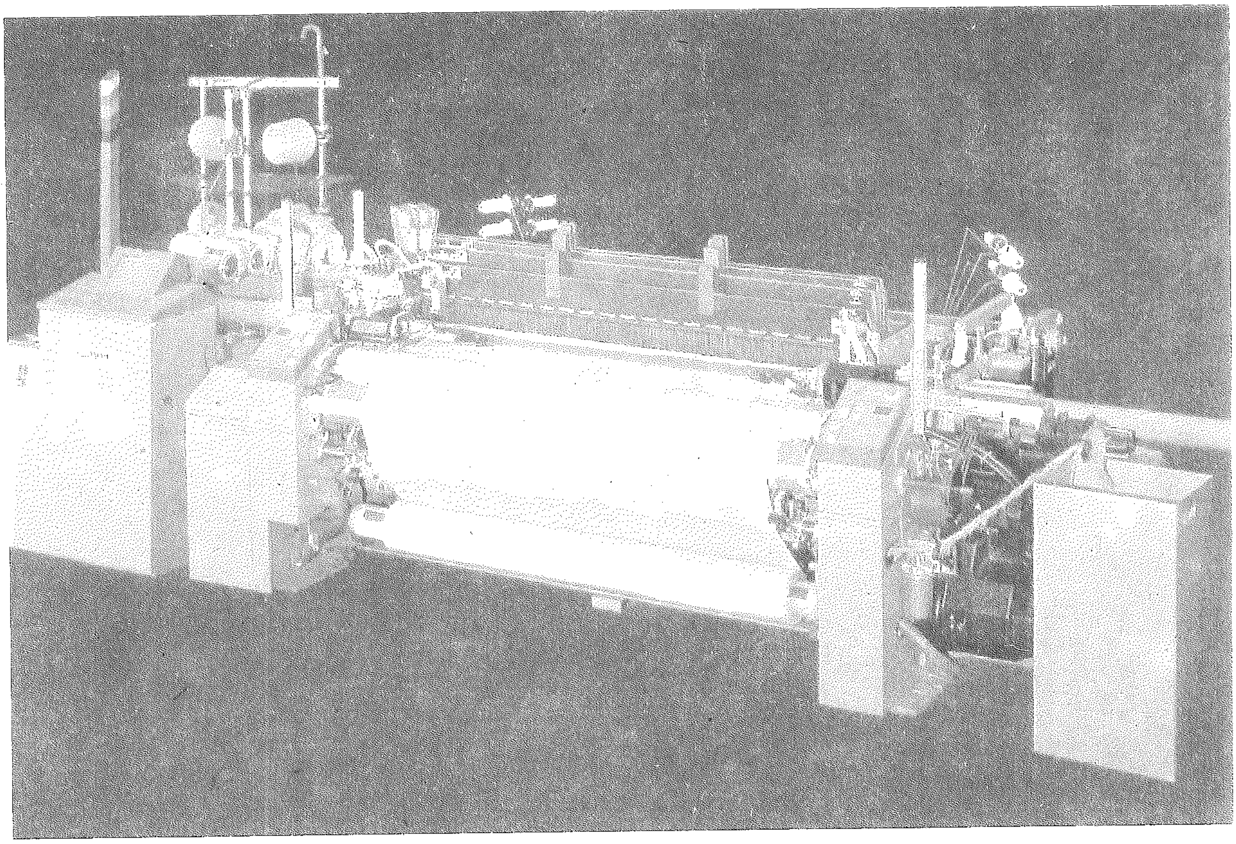
3.4.7.2 Rapier Weaving

Rapier loom is another type of shuttle less loom. Instead of employing shuttle or a projectile for weft insertion it uses rapiers. Normally two single flexible rapiers are used. Only a small number of rapier looms are installed in Pakistan

Types of Rapier Looms

Different types of rapier looms are as follows;

- Single rigid rapier
- Double rigid rapier
- Double telescopic rapier
- Double flexible rapier- most common
- Twin Head rigid rapier



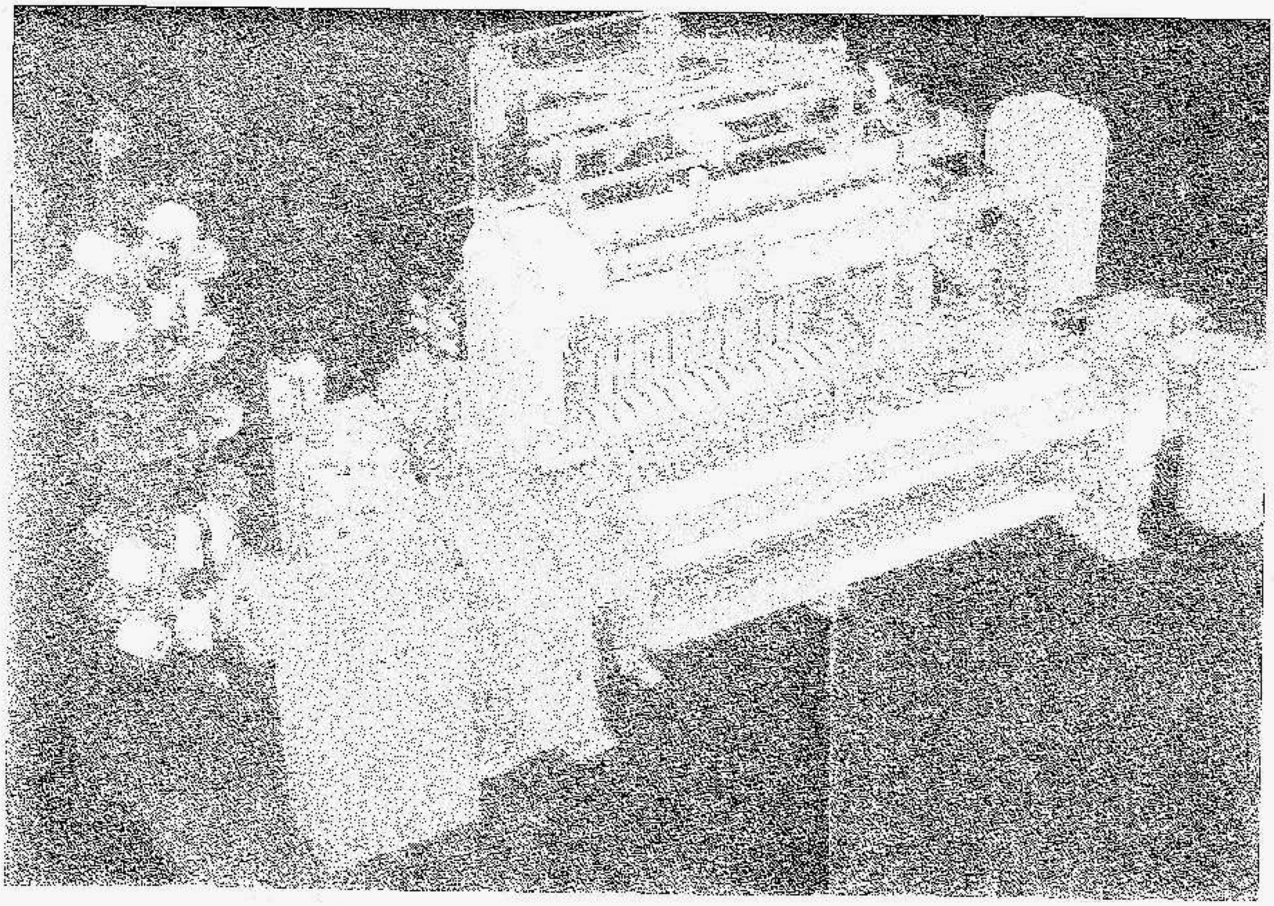
Rapier Weaving Machine

Working Standard

- These looms are available in 76, 110, 130, 153 inch.
- The speed ranges between 200 –300.
- Motor capacity 6 - 7 Kw

3.4.7.3 Air Jet Weaving

Air jet loom is yet another type of shuttle less loom. The weft yarn is carried across the width of fabric by using air pressure. It is a very high-speed machine and hence it gives high production as compared to projectile, rapier and shuttle looms.



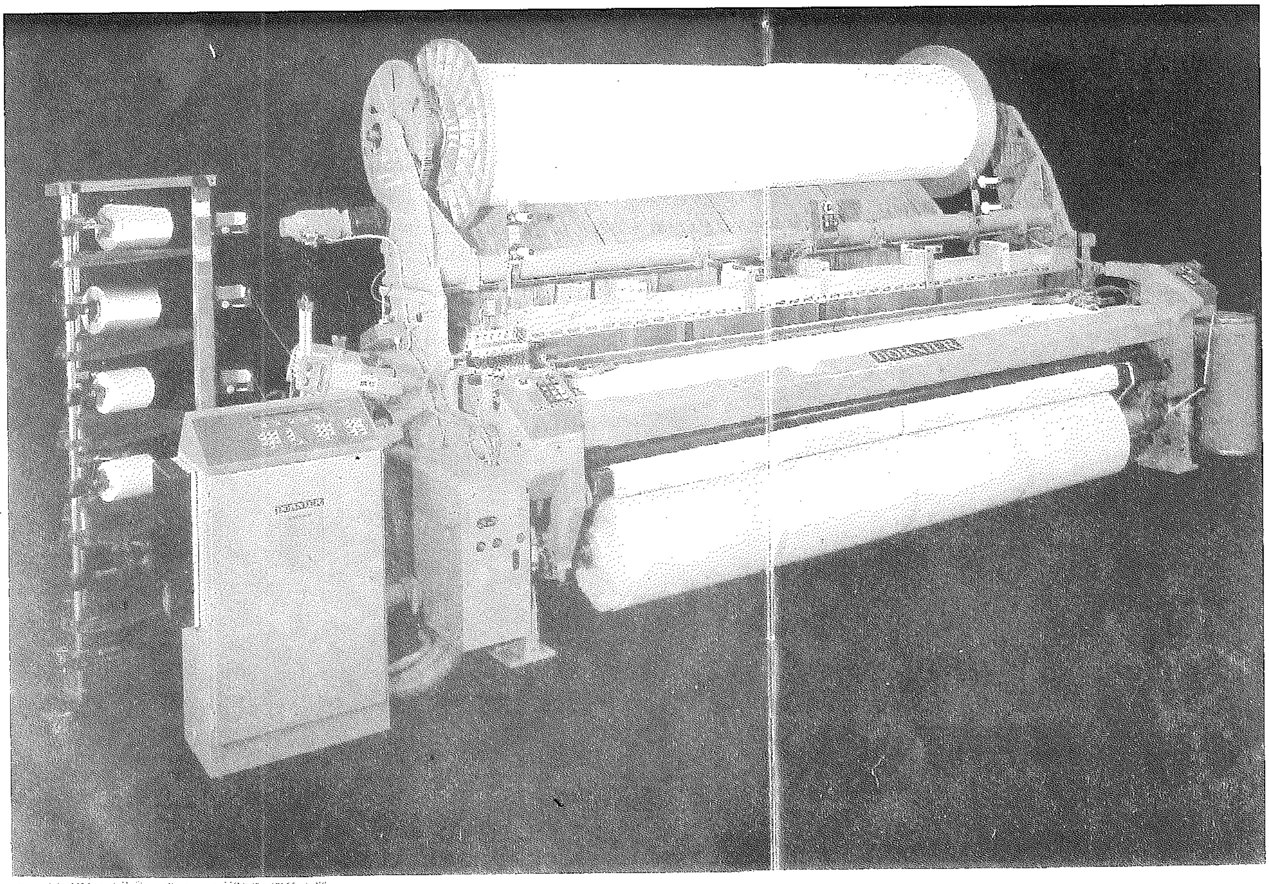
Air Jet Weaving Machine

Working Standards

- Width 190cm to 380 cm
- The theoretical speed can be up to 1100 rpm
- Normal operation speed ranges between 400 and 800 depending upon the machine width and fabric construction.
- Motor Capacity 6-8 Kw
- The power consumption is higher on these looms as compared to all other looms. This is due to additional power required for compressed air.

3.4.7.4 Towel Weaving

In this weaving, the machines utilized are specifically designed to make towel fabric. They are known as towel looms. These machines are installed in some of the big units in organized sector. But majority lies in unorganized sector. In unorganized sector their machine mechanism is similar to Shuttle Weaving. Hence it's all parameters of production and costing is similar to shuttle weaving.



Terry Towel Loom

3.4.7.5 Narrow – Width Weaving

Technically, fabrics less than 30 inches wide are considered as narrow width fabrics, and the machines used to produce these fabrics are narrow width looms. This is a relatively small sector of textile weaving.

3.4.7.5.1 Types of Narrow-width Fabrics

Common types of narrow fabrics are

- Belts, ribbons and tapes
- Woven Labels
- Hand Towels in roll form

Machines Used

Both local and imported machines are used in this sector. Generally, machines speeds are higher due to narrow width. The production depends on the number of width being produced side by side and the design of the fabric.

3.5 Material wastages

At various stages of production in weaving, material is wasted due to the very nature of the operation. This leads to discrepancies between the yarn in-put and fabric produced. The stages at which these differences are introduced include.

- Short weight in yarn bags
- Count variations in yarn
- Pirn winding
- warping
- Sizing
- Looming
- weaving
- Inspection/Folding

The wastage level may vary from one mill set up to another. The factors that affect these levels may be outlined as below:

- The quality and type of yarn
- Count of yarn
- Fabric construction
- Type of weaving loom
- Weaving conditions
- Type of selvedge
- Industry set up
- Management and process Controls

3.5.1 Actual Yarn Wastage in Weaving

wastage of yarn occurs in weaving Sector at warping (cone waste, beam waste), sizing (unsized/sized long and short), pirn winding and loom shed stage (i.e. floor sweep). Following are the average wastage percentages in weaving.

Table-3.5

Average Yarn Wastage on Shuttle Looms

Yarn count	Warping / Sizing	Weaving	Total
40-60	1%	2.5%	3.5%
30-40	1%	3.5%	4.5%
20-30-	1.25%	4%	5.25%
07-20	1.5%	4.5%	6%

Source: All Pakistan Cotton Power Looms Association

Table-3.6

Average Yarn Wastage on Shuttleless Looms

Yarn count	Warping / Sizing	Weaving	Total
40-60	1%	2%	3%
30-40	1%	3%	4%
20-30-	1.25%	3.5%	4.75%
06-20	1.5%	4%	5.5%

Source: All Pakistan Cotton Power Looms Association

Table-3.7

Grey Cloth Rejection Percentage

Yarn Count	Shuttle Looms	Shuttle-less Looms
30/1 +	3-4%	2-3%
30/1 -	3-4%	1-2%

(Note: This rejection is in the shape of fabric which has its own market value)

3.6 Elements of Fabric Cost/Conversion Charges

In addition to yarn cost a weaver needs to consider other factors in order to calculate the conversion cost of fabric. This would include electricity cost, sizing cost, labour cost and rejection cost. The tables below indicate the electricity cost and sizing cost.

3.6.1 Electricity Cost

Electricity cost can be worked out for any motor by using the following data;

1 HP = 746 Watt
1Kw = 1000 Watt

An electrical appliance of 1Kw rating, working at full load, consumes one unit of electricity. See the table underneath for explanation.

Table-3.8
Electricity Cost

Loom Width	Motor HP	Electric units consumed
56"	1HP=746w	0.75 unit/hr
120"	2 HP=1.5Kw	1.5 unit/hr

Table-3.9

Sizing Cost

(For 30s Cotton/PC Yarn)

Expenses(Rs./kg yarn sized)	Shuttle weaving	Shuttle-less weaving
Gas Boiler	Rs. 2.00/Kg	Rs. 2.00/Kg
Electricity	Rs. 0.50/kg	Rs.0.50/Kg
Sizing chemicals	Rs. 5-6/Kg	Rs.7-8/ Kg

3.7 Specifications of General Type of Cloth

Table 3.10

A. Shuttle Looms Cloth

Construction	Width
24x24 / 52x52	38", 87" Long Cloth Latha
24x24 / 60x60	38"
21x21 / 60x60	63"
30x30 / 68x50	30"
30x30 / 68x68	38", 41", 50", 63" Poplin
35x35 / 76x56 pc	47", 63", 69", 75", 83", 93", 102", 104", 112"
36x36 / 64x56	63" Poplin

Table 3.11

B. Shuttleless looms Cloth

Construction	Width
14x14 / 80x52	47.50"
16x12 / 108x56	47.50", 65"
20x12 / 118x52	63", 65"
20x16 / 128x60	63"
20x20 / 108x54	63"
20x20 / 108x58	47.50", 63"
30x30 / 130x70	63"
20x12 / 86x50	64"
40/2x16 / 102x52	64"
20x20 / 118x52	63" Bed Foard cord
30x20 / 115x55	67"
20x20 / 108x54	63"

3.8 Formula For Daily Production of Looms

(RPM x minutes per hour x hours per day x efficiency) / No. of picks per inch / (inches per yard x 1.0936) = Linear Meters per day

For example the daily production of a loom having 130 RPM and manufacturing fabric of 56 picks will be calculated:

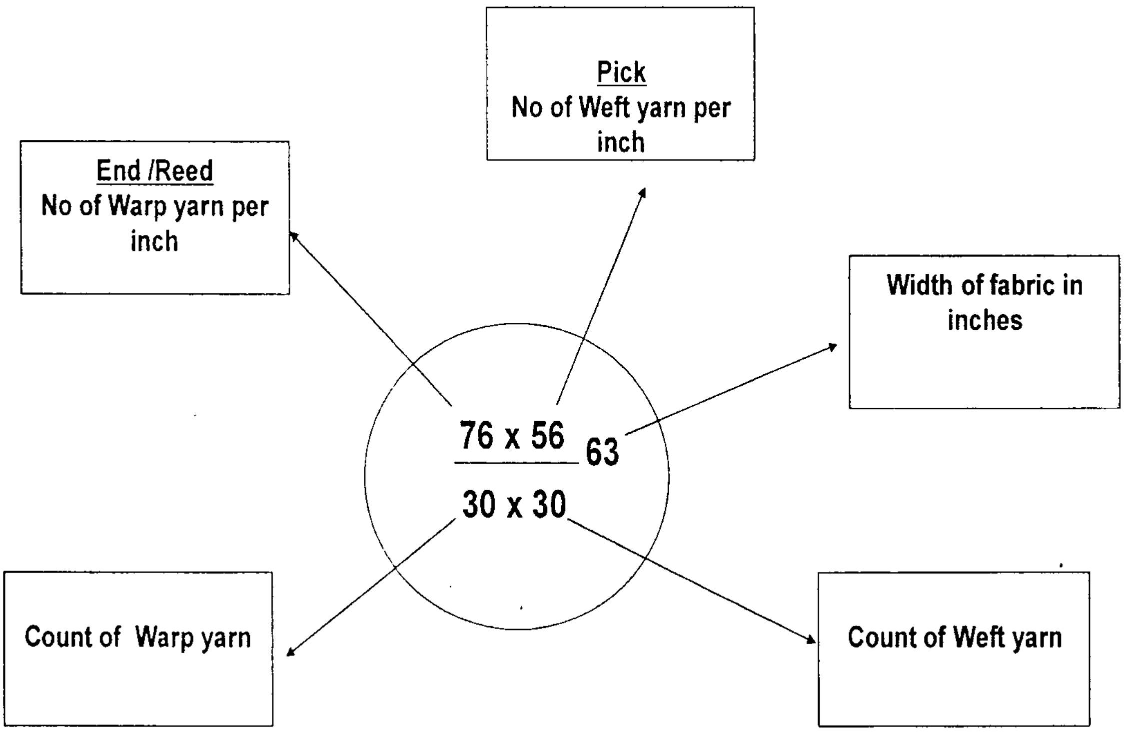
130 x 60 x 24 / 56=3343 inches/39.37 to arrive at meters = 85 meters

Source: All Pakistan Cotton Power Looms Association

Table 3.12

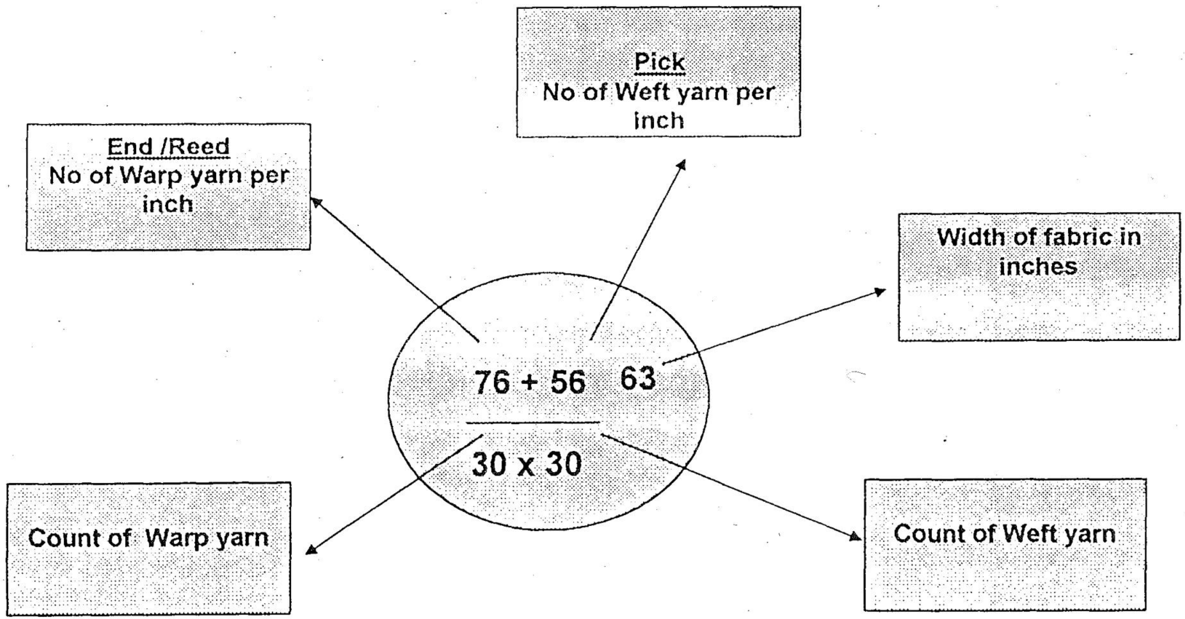
3.8.1 DESCRIPTION OF FABRIC SPECIFICATIONS

$$\text{e.g.} \quad \frac{76 \times 56}{30 \times 30} \quad 63''$$



3.8.1 DESCRIPTION OF FABRIC SPECIFICATION

e.g. $\dfrac{76 + 56}{30 \times 30}$ 63"



3.9 (A) PRODUCTION CAPACITY OF DIFFERENT LOOMS

Table 3.12

A. SHUTTLELESS LOOMS (PRODUCTIO IN METERS PER DAY AT 85% EFFICIENCY)

No. of Picks per Inch	Fabric Width and their respective RPM							
	153	inches	130	inches	110	inches	75	inches
	250	rpm	270	rpm	300	rpm	350	rpm
	L. Mtrs.	Sq. Mtrs.	L. Mtrs.	Sq. Mtrs.	L. Mtrs.	Sq. Mtrs.	L. Mtrs.	Sq. Mtrs.
24	323.85	1258.55	349.76	1154.91	388.62	1085.81	453.39	863.71
28	277.59	1078.76	299.79	989.92	333.10	930.69	388.62	740.32
32	242.89	943.91	262.32	866.18	291.47	814.36	340.04	647.78
36	215.90	839.03	233.17	769.94	259.08	723.87	302.26	575.81
40	194.31	755.13	209.86	692.94	233.17	651.49	272.03	518.23
44	176.65	686.48	190.78	629.95	211.97	592.26	247.30	471.12
48	161.93	629.28	174.88	577.45	194.31	542.90	226.70	431.86
52	149.47	580.87	161.43	533.03	179.36	501.14	209.26	398.64
56	138.79	539.38	149.90	494.96	166.55	465.35	194.31	370.16
60	129.54	503.42	139.90	461.96	155.45	434.32	181.36	345.48
64	121.44	471.96	131.16	433.09	145.73	407.18	170.02	323.89
68	114.30	444.19	123.44	407.61	137.16	383.23	160.02	304.84
72	107.95	419.52	116.59	384.97	129.54	361.94	151.13	287.90
76	102.27	397.44	110.45	364.71	122.72	342.89	143.18	272.75
80	97.16	377.57	104.93	346.47	116.59	325.74	136.02	259.11
84	92.53	359.59	99.93	329.97	111.03	310.23	129.54	246.77
88	88.32	343.24	95.39	314.97	105.99	296.13	123.65	235.56
92	84.48	328.32	91.24	301.28	101.38	283.25	118.28	225.32
96	80.96	314.64	87.44	288.73	97.16	271.45	113.35	215.93
100	77.72	302.05	83.94	277.18	93.27	260.59	108.81	207.29

Source: All Pakistan Cotton Power Looms Association

Table 3.13

3.9 (B) AIR JET LOOMS (PRODUCTION IN METERS PER DAY AT 90% EFFICIENCY)

No. of Picks per Inch	Width and their respective RPM							
	134 inches		110 inches		90 inches		75 inches	
	500 rpm		600 rpm		700 rpm		800 rpm	
	L. Mtrs.	Sq. Mtrs.	L. Mtrs.	Sq. Mtrs.	L. Mtrs.	Sq. Mtrs.	L. Mtrs.	Sq. Mtrs.
24	685.80	2334.20	822.96	2299.36	960.12	2194.84	1097.28	2090.33
28	587.83	2000.74	705.40	1970.88	822.96	1881.29	940.53	1791.71
32	514.35	1750.65	617.22	1724.52	720.09	1646.13	822.96	1567.75
36	457.20	1556.13	548.64	1532.91	640.08	1463.23	731.52	1393.55
40	411.48	1400.52	493.78	1379.62	576.07	1316.91	658.37	1254.20
44	374.07	1273.20	448.89	1254.20	523.70	1197.19	598.52	1140.18
48	342.90	1167.10	411.48	1149.68	480.06	1097.42	548.64	1045.16
52	316.52	1077.32	379.83	1061.24	443.13	1013.00	506.44	964.77
56	293.91	1000.37	352.70	985.44	411.48	940.65	470.26	895.85
60	274.32	933.68	329.18	919.74	384.05	877.94	438.91	836.13
64	257.18	875.32	308.61	862.26	360.05	823.07	411.48	783.87
68	242.05	823.83	290.46	811.54	338.87	774.65	387.28	737.76
72	228.60	778.07	274.32	766.45	320.04	731.61	365.76	696.78
76	216.57	737.12	259.88	726.11	303.20	693.11	346.51	660.10
80	205.74	700.26	246.89	689.81	288.04	658.45	329.18	627.10
84	195.94	666.91	235.13	656.96	274.32	627.10	313.51	597.24
88	187.04	636.60	224.44	627.10	261.85	598.59	299.26	570.09
92	178.90	608.92	214.69	599.83	250.47	572.57	286.25	545.30
96	171.45	583.55	205.74	574.84	240.03	548.71	274.32	522.58
100	164.59	560.21	197.51	551.85	230.43	526.76	263.35	501.68

Source: All Pakistan Cotton Power Looms Association

Table 3.14

3.9 (C) AUTO/SHUTTLE LOOMS (PRODUCTION IN METERS PER DAY AT 90% EFFICIENCY)

No. of Picks per Inch	Fabric Width and their respective RPM											
	120	inches	105	inches	96	inches	76	inches	56	inches	44	inches
	90	rpm	110	rpm	120	rpm	140	rpm	160	rpm	180	rpm
	L. Mtrs.	Sq. Mtrs.	L. Mtrs.	Sq. Mtrs.	L. Mtrs.	Sq. Mtrs.	L. Mtrs.	Sq. Mtrs.	L. Mtrs.	Sq. Mtrs.	L. Mtrs.	Sq. Mtrs.
24	123.44	376.26	150.88	402.39	164.59	401.34	192.02	370.68	219.46	312.16	246.89	275.92
28	105.81	322.51	129.32	344.90	141.08	344.01	164.59	317.73	188.11	267.56	211.62	236.51
32	92.58	282.19	113.16	301.79	123.44	301.01	144.02	278.01	164.59	234.12	185.17	206.94
36	82.30	250.84	100.58	268.26	109.73	267.56	128.02	247.12	146.30	208.10	164.59	183.95
40	74.07	225.76	90.53	241.43	98.76	240.81	115.21	222.41	131.67	187.29	148.13	165.55
44	67.33	205.23	82.30	219.48	89.78	218.91	104.74	202.19	119.70	170.27	134.67	150.50
48	61.72	188.13	75.44	201.19	82.30	200.67	96.01	185.34	109.73	156.08	123.44	137.96
52	56.97	173.66	69.64	185.72	75.97	185.24	88.63	171.09	101.29	144.07	113.95	127.35
56	52.90	161.25	64.66	172.45	70.54	172.00	82.30	158.86	94.05	133.78	105.81	118.25
60	49.38	150.50	60.35	160.96	65.84	160.54	76.81	148.27	87.78	124.86	98.76	110.37
64	46.29	141.10	56.58	150.90	61.72	150.50	72.01	139.01	82.30	117.06	92.58	103.47
68	43.57	132.80	53.25	142.02	58.09	141.65	67.77	130.83	77.46	110.17	87.14	97.38
72	41.15	125.42	50.29	134.13	54.86	133.78	64.01	123.56	73.15	104.05	82.30	91.97
76	38.98	118.82	47.65	127.07	51.98	126.74	60.64	117.06	69.30	98.58	77.96	87.13
80	37.03	112.88	45.26	120.72	49.38	120.40	57.61	111.21	65.84	93.65	74.07	82.78
84	35.27	107.50	43.11	114.97	47.03	114.67	54.86	105.91	62.70	89.19	70.54	78.84
88	33.67	102.62	41.15	109.74	44.89	109.46	52.37	101.10	59.85	85.13	67.33	75.25
92	32.20	98.15	39.36	104.97	42.94	104.70	50.09	96.70	57.25	81.43	64.41	71.98
96	30.86	94.06	37.72	100.60	41.15	100.34	48.01	92.67	54.86	78.04	61.72	68.98
100	29.63	90.30	36.21	96.57	39.50	96.32	46.09	88.96	52.67	74.92	59.25	66.22

Source: All Pakistan Cotton Power Looms Association

3.10 FORMULA FOR PRODUCTION ON POWERLOOMS AND COSTING OF WOVEN CLOTH FROM YARN

Table 3.15

(Rate in Rupees per Meter)

S.No.	Description	Type of Cloth					Warp Weight (LBS)	Weft Weight (LBS)	Warp Rate (LBS)	Weft Rate (LBS)	Warp Price	weft Price	Avg. Con. Charges	Cost of Grey Cloth	Procc. Charges	Finished Cost
		Reed	Picks	Count	Count	Width Inch										
1	PC	76	52	35	35	47	0.139	0.095	54	50	7.51	4.75	3.75	16.01	4.70	20.71
2	PC	76	52	35	35	63	0.186	0.128	54	50	10.04	6.40	4.50	20.94	6.30	27.24
3	PC	76	52	35	35	66	0.195	0.134	54	50	10.53	6.70	4.50	21.73	6.60	28.33
4	PC	76	52	35	35	69	0.204	0.140	54	50	11.02	7.00	4.50	22.52	6.90	29.42
5	PC	76	52	35	35	75	0.221	0.152	54	50	11.93	7.60	5.00	24.53	7.50	32.03
6	PC	76	52	35	35	83	0.245	0.168	54	50	13.23	8.40	6.00	27.63	8.30	35.93
7	PC	76	52	35	35	87	0.257	0.176	54	50	13.88	8.80	6.00	28.68	8.70	37.4
8	PC	76	52	35	35	89	0.263	0.180	54	50	14.20	9.00	6.00	29.20	8.90	38.10
9	PC	76	52	35	35	93	0.275	0.188	54	50	14.85	9.40	6.00	30.25	9.30	39.55
10	PC	76	52	35	35	98	0.289	0.199	54	50	15.61	9.95	6.00	31.56	9.80	41.36
11	PC	76	52	35	35	102	0.301	0.207	54	50	16.25	10.35	8.00	34.60	10.20	44.80
12	PC	76	52	35	35	104	0.307	0.211	54	50	16.58	10.55	8.00	35.13	10.40	45.53
13	PC	76	52	35	35	112	0.331	0.227	54	50	17.87	11.35	8.00	37.22	11.20	48.42
14	PC	76	56	30	30	63	0.281	0.160	46	44	10.03	7.04	4.50	21.57	6.30	27.87
15	PC	76	56	30	30	66	0.228	0.168	46	44	10.49	7.39	4.50	22.38	6.60	28.98
16	PC	76	56	30	30	69	0.238	0.176	46	44	10.95	7.74	4.50	23.19	6.90	30.09
17	PC	76	56	30	30	75	0.259	0.191	46	44	11.91	8.40	5.00	25.32	7.50	32.82
18	PC	76	56	30	30	83	0.287	0.211	46	44	13.20	9.28	6.00	28.49	8.30	36.79
19	PC	76	56	30	30	87	0.301	0.222	46	44	13.85	9.77	6.00	29.61	8.70	38.31
20	PC	76	56	30	30	89	0.307	0.227	46	44	14.12	9.99	6.00	30.11	8.90	39.01
21	PC	76	56	30	30	93	0.321	0.237	46	44	14.77	10.43	6.00	31.19	9.30	40.49
22	PC	76	56	30	30	98	0.339	0.250	46	44	15.59	11.00	6.00	32.59	9.80	42.39
23	PC	76	56	30	30	102	0.352	0.260	46	44	16.19	11.44	8.00	35.63	10.20	45.83
24	PC	76	56	30	30	104	0.359	0.265	46	44	16.51	11.66	8.00	36.17	10.40	46.57
25	PC	76	56	30	30	112	0.387	0.285	46	44	17.80	12.54	9.00	39.34	11.20	50.54
26	Latha	52	52	24	24	38	0.112	0.112	44	42	4.93	4.70	4.00	13.63	3.75	17.38
27	Latha	52	52	24	24	87	0.256	0.256	44	42	11.26	10.75	6.00	28.02	4.25	32.27
28	Latha	60	60	24	24	38	0.129	0.129	44	42	5.68	5.42	4.00	15.09	3.75	18.84
29	Latha	60	60	21	21	63	0.246	0.246	40	41	9.84	10.09	6.00	25.93	4.05	29.98
30	Latha	68	50	30	30	30	0.092	0.068	40	41	3.68	2.79	4.00	10.47	3.50	13.97
31	Poplin	68	68	30	30	38	0.117	0.117	52	50	6.08	5.85	4.00	15.93	3.40	19.33
32	Poplin	68	68	30	30	41	0.127	0.127	52	50	6.60	6.35	5.00	17.95	4.10	22.05
33	Poplin	68	68	30	30	50	0.154	0.155	52	50	8.01	7.75	5.00	20.76	5.00	25.76
34	Poplin	68	68	30	30	63	0.195	0.195	52	50	10.14	9.75	6.00	25.90	6.30	32.19
35	Lawn	56	56	40	60	47	0.089	0.059	62	60	5.52	3.54	5.00	14.06	8.00	22.06
36	Lawn	56	56	40	60	51	0.095	0.064	62	60	5.89	3.84	6.00	15.73	7.75	23.48
37	Lawn	56	60	40	60	47	0.081	0.064	62	60	5.02	3.84	6.00	14.86	6.50	21.36
38	Lawn	56	60	40	60	51	0.095	0.068	62	60	5.89	4.08	6.00	15.97	6.50	22.47
39	Lawn	60	60	60	60	47	0.064	0.064	120	100	7.68	6.40	7.00	21.08	6.50	27.58
40	Lawn	60	60	60	60	51	0.069	0.069	120	100	8.28	6.90	7.00	22.18	6.50	28.68
41	Lawn	80	70	80	80	47	0.064	0.064	120	100	7.68	6.40	8.00	22.08	8.25	30.33
42	Lawn	80	70	80	80	51	0.069	0.069	120	100	8.28	6.90	8.00	23.18	8.25	31.43

Source All Pakistan Cotton Power Looms Association

3.10.1 Notes to Table 3.15

Formula for calculation of weight of Fabric

A. if the counts of yarn of warp and weft are different then we have to calculate the warp and weft weights separately and then add both weights

For warp weight

$$\frac{\text{Reeds or Ends per inch x width of cloth}}{\text{warp count x 840}} = \text{Pounds (Lb) per yard}$$

For weft weight

$$\frac{\text{Picks per inch x width of cloth}}{\text{weft count x 840}} = \text{Pounds (Lb) per yard}$$

B. if the count of yarn for warp and weft are same then the total weight of cloth will be calculated as follows:

$$\frac{\text{(Reeds or Ends per inch+Picks per inch)x width of cloth}}{\text{warp or weft count x 840}} = \text{Pounds (Lb) per yard}$$

NOTE 1 (Explaination relating to formulae given above)

(i) For calucating total weight of the cloth multiply with linear yards.

(ii) For conversion into LBS/meter multiply the result by 1.0936

(iii) For conversion into grams/meter (Result at note B above) multiply by 1000 and then divide by 2.2046

(iv) Add 5% allowance for shrinkage or wastage.,

(v) End are also knows as reeds.

NOTE 2

Conversion charges vary due to demand and supply factor. In June. 2002 these rates are based on power looms @ paisa 13/pick for fabric width of 98",

conversion charges for auto looms, shuttle less looms and air jet looms will be paisa 16/pick, paisa 21/pick and paisa 23/pick

The calculation includes element of shrinkage @ 5%

Conversion charges will change upward in case of wider width fabric.

NOTE 3

Processing charges are minimum. These may vary due to followin factors:

. Colour scheme

. Type of dyes (pigment, reactive)

. Finishing standard

. Processing nature

. No. of design

. Type of design

. Quality or special instructions of buyers

Caution: Rates of yarn, processing & conversion charges are at the time of preparation of this table.

Table 3.16

Distribution of Looms in Faisalabad on the basis of width.

CATEGORY	SMALL	MEDIUM	LARGE
Size of Looms	44" – 56"	56" – 90"	90" – 120"
Estimated %age share	45%	25%	30%

Table 3.17

Approx. No. of Power Looms and Distribution in Faisalabad

UNITS OF	4 – 12 LOOMS	3790
UNITS OF	12- 24 LOOMS	2550
UNITS OF	24 AND ABOVE	592

Following is the total number of looms registered with Sales Tax Faisalabad, Multan, Karachi & Gujranwala till 30.06.2001 including looms taken on lease, silk looms & looms of Gujranwala manufacturing Art Silk Cloth, Shaneel, Jarjet, etc.

	Faisalabad	Multan	Karachi	Gujranwala
Conventional Power Looms	25596			
Auto Power Looms	9470			
Shuttle less Looms	4090			
Total	39156	3000	4190	810

3.11 Factors of Input Tax Adjustment in Weaving

Yarn is the major input of grey cloth, which coves around 70-75% value of grey, depending upon different elements. After input tax adjustment on yarn, the value addition carries two types of inputs i.e. taxable inputs and non taxable inputs. Taxable inputs include electricity, sizing material, spare parts and lubricants; non-taxable inputs are labour charges, rent, transportation and financial charges etc. As an illustration, following cost of all inputs except yarn, is estimated in the manufacture of one meter grey cloth on auto looms having specifications

Fabric Specification $\frac{76x56}{30x30}$ x"98.

	A Taxable Inputs		B Non-Taxable Input	
Electricity	Rs. 2.12	(26%)	Rs. 3.74	(46%)
Sizing	Rs. 1.44	(18%)		
Spares & Lubricants	Rs. 0.75	(10%)		
Total	Rs. 4.31	(54%)		
Total (A+B)	4.31 + 3.74=Rs 8 per meter			

The above working suggests that

a) the output of looms units working as venders on conversion charges should be more than 40% of their input;
b) input tax of such units should not exceed 50%-55% of their output tax; and
c) the weaving units not corresponding to the above ranges (a) and (b) need to be focused for audit purposes.

3.12 Weight Gain and Count Variation

The application of sizing material results into weight gain in the grey cloth over weight of yarn consumed for weaving. But this additional weight normally comes to normal level of yarn weight once the grey cloth passes through the process of bleaching, dying, printing and finishing. It is, pointed out that no change in the count of yarn takes place during weaving process. However $\pm$ 2-3 count variation takes place in the processing of grey cloth.

3.12.1 Shrinkage of Fabric

In general, the factors that control shrinkage are the stability of the fiber and the construction of the fabric. Construction is based on the type of weave, the amount of twist in the yarn, the thread count, and the yarn count. For example, percales shrink from 3 to 8 percent, depending upon thread count, and flannelettes may shrink 10 percent or more. In terms of fitted garments, a 3 percent shrinkage of man's shirt would reduce the collar from size 15 to 14 ½ : a 5 percent shrinkage in a woman's dress would reduce size 16 to 14 in general fit and to size 12 in length. The final finishing process also affects shrinkage; for example, a water-repellent quality in a fabric offers resistance to subsequent shrinkage.

3.13 Issues Relating to Sales Tax

3.13.1 Except composite textile mills and weaving units of unorganized sector registered to meet the requirements of exporters, looms manufacturing narrow width fabric for local use are still unregistered. As a result this unregistered regime

- Is in constant demand for yarn without tax invoice, thus creating situation for yarn flying invoices.
- Is in a way helping the unregistered wholesalers/investors of grey cloth to carry out their business outside the tax net.
- Is instrumental in non-reporting of fabric processed by the processing industry for sale in the local market.

3.13.2 The registration Division does not carry out proper scrutiny of documents, physical verification of premises and specifications of looms installed there before issuing sales tax registration certificate to a loom unit. As a result some registered persons tend to issue tax invoices of abnormal quantity and quality of grey cloth which do not match with their installed capacity and specifications.

3.13.3 The concept of flying invoices is peculiar and especially associated with loom industry. Majority of the wholesalers of yarn / cloth are unregistered. Similarly major portion of the loom sector is also unregistered. The exporters who purchase cloth from local market / unregistered wholesalers are forced to purchase flying invoices from registered weavers to claim sales tax refund.

3.13.4 It has also been observed that certain loom owners who cater for exporters on conversion basis declare to have obtained looms on lease basis from unregistered loom owners. Although they submit lease agreement at the time of seeking sales tax registration, the factual position some times is not verifiable due to concentration of loom units in one premises as well as unholy alliance of leassee and the leaser. Resultantly the registered leassee might issue abnormal invoices of cloth in a few months, generate undue refund against such invoices, pay meager amount of sales tax showing higher purchases and close his business after sometime leaving no trace for the department for recovery.

3.13.5 Manufacturer having annual turn over of less than Rs. 5 lac is exempt from Sales Tax registration. Manufacturer having turnover of Rs. 2.5 million comes turnover tax. A large number of looms units work as venders on conversion charges basis and avoid registration on the ground that their turn over calculated on the basis of conversion charges is below the threshold for registration. The production capacity of looms installed in a weaving unit need to be worked out as per formulae given in Table 3.12-3.15 to assess the genuineness of the claim of exemption from registration from Sales Tax.

3.13.6 Normal input adjustment of a loom unit running on conversion basis works out to 50-60% of its value addition. But many loom units working as venders claim excessive inputs to avoid tax payment from their output.

3.14 Audit Guidelines

3.14.1 Match the machinery installed with production capacity; cross check with supply invoices especially with reference to width of installed looms and invoices of grey cloth issued by the unit.

3.14.2 Carry out production assessment with respect to use of paper cones and polypropylene begs

3.14.3 Cross check count of yarn purchases vis-à-vis with fabric supplies by the weaving unit i.e. matching of quantity, consumption and blend ratio of yarn and grey cloth.

3.14.4 Input adjustment should not increase 50-55% of value addition in case the unit is working on conversion charges basis.

3.14.5 Ascertain quantum of supply and size of cloth vs. manufacturing capacity and size of looms.

3.14.6 If a unit is claiming excessive carry forward and making tax lesser payments, match the stock with purchase invoices.

3.14.7 See if the sizing and weaving wastage are within the reasonable limit/range.

3.14.8 Is the sizing material shown to have been used actually useable in the quality of fabric actually manufactured by the unit.

3.14.9 If unit is working on lease basis, is the lease agreement duly registered with the concerned authority i.e. Excise & Taxation Department and fully intimated to Income Tax department.

3.14.10 Ascertain the complete addresses of the owners of yarn which has been converted into fabric by the weaving unit on conversion charges basis so as to determine the tax/registration liability of such persons.

WEAVING

Summary of Important Information

1 Sizing Requirements

- Only Warp yarn require sizing
- Generally PVA is invariably used for P/C blends.
- Course cotton count don't need PVA .
- Finer cotton as well as P/C yarns do need some proportion of PVA.
- CMC is used for polyester yarns only.
- Maiz starch and rice power are alternatively used.
- Current rate of PVA, maiz starch, rice power and tallow are Rs. 125/kg, Rs 20/kg, Rs 12/kg and Rs 11/kg respectively.

2. Value addition by Sizing on Shuttle Weaving 8%

3. Average Yarn Wastage on Shuttle Looms

Yarn count	Warping / Sizing	Weaving	Total
40-60	1%	2.5%	3.5%
30-40	1%	3.5%	4.5%
20-30-	1.25%	4%	5.25%
07-20	1.5%	4.5%	6%

4. Average Yarn Wastage on Shuttleless Looms

Yarn count	Warping / Sizing	Weaving	Total
40-60	1%	2%	3%
30-40	1%	3%	4%
20-30-	1.25%	3.5%	4.75%
06-20	1.5%	4%	5.5%

5. Grey Cloth Rejection Percentage

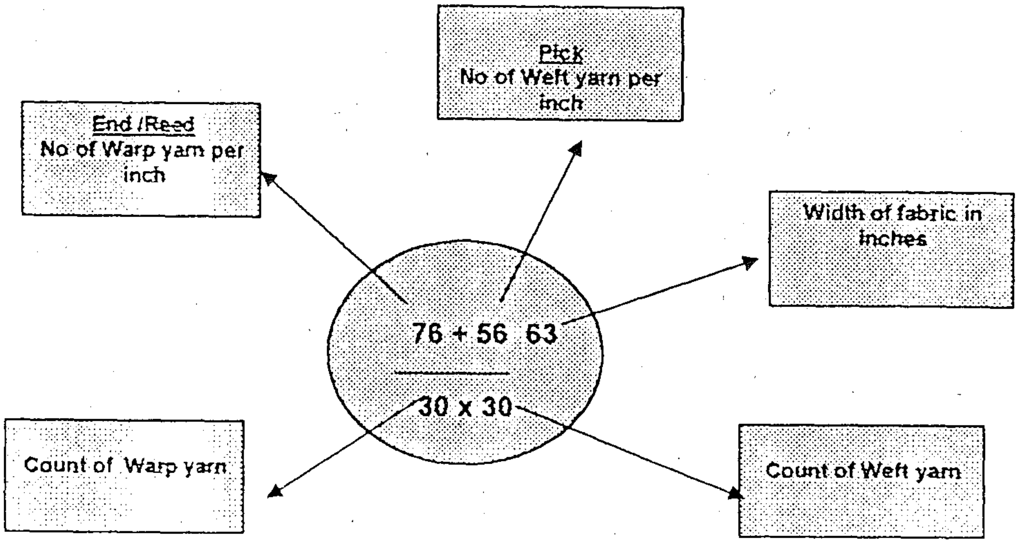
Yarn Count	Shuttle Looms	Shuttle-less Looms
30/1 +	3-4%	2-3%
30/1 -	3-4%	1-2%

6. Formula For Daily Production of Looms

(RPM x minutes per hour x hours per day x efficiency) / No. of picks per inch / (inches per yard x 1.0936) = Linear Meters per day

7. DESCRIPTION OF FABRIC SPECIFICATION

e.g $\dfrac{76 + 56}{30 \times 30}$ 63"



8. Input Tax Adjustment In Weaving

(on electricity , sizing, lubricants, spares = 50%-55%

9. Count Variation

No change in the count of yarn takes place during weaving process.
However ± 2-3 count variation takes place in the processing of grey cloth.

10. Shrinkage of Fabric

Average shrinkage	=	5%
Precale shrinkage	=	3-8%

11. COSTING OF WOVEN CLOTH FROM YARN

Type of Cloth					Warp Weight	Weft Weight	Warp Rate	Weft Rate	Warp Price	weft Price	Avg. Con. Charges
Reed	Picks	Count	Count	Width Inch	LBS	LBS	Rs./LBS	Rs./LBS			
76	56	30	30	63	0.281	0.160	46	44	10.03	7.04	4.50
76	56	30	30	112	0.387	0.285	46	44	17.80	12.54	9.00
56	56	40	60	51	0.095	0.064	62	60	5.89	3.84	6.00

12. Formula for calculation of weight of Fabric

A. if the counts of yarn of warp and weft are different then we have to calculate the warp and weft then add both weights

For warp weight

$$\frac{\text{Reeds or Ends per inch x width of cloth}}{\text{Warp count x 840}} = \text{Pounds (Lb) per yard}$$

For weft weight

$$\frac{\text{Picks per inch x width of cloth}}{\text{weft count x 840}} = \text{Pounds (Lb) per yard}$$

B. if the count of yarn for warp and weft are same then the total weight of cloth will be calculated

$$\frac{\text{(Reeds or Ends per inch+Picks per inch)x width of cloth}}{\text{warp or weft count x 840}} = \text{Pounds (Lb) per}$$

(Note: For details see notes 1-3 to Table No. 3.15)

Chapter 4
PROCESSING

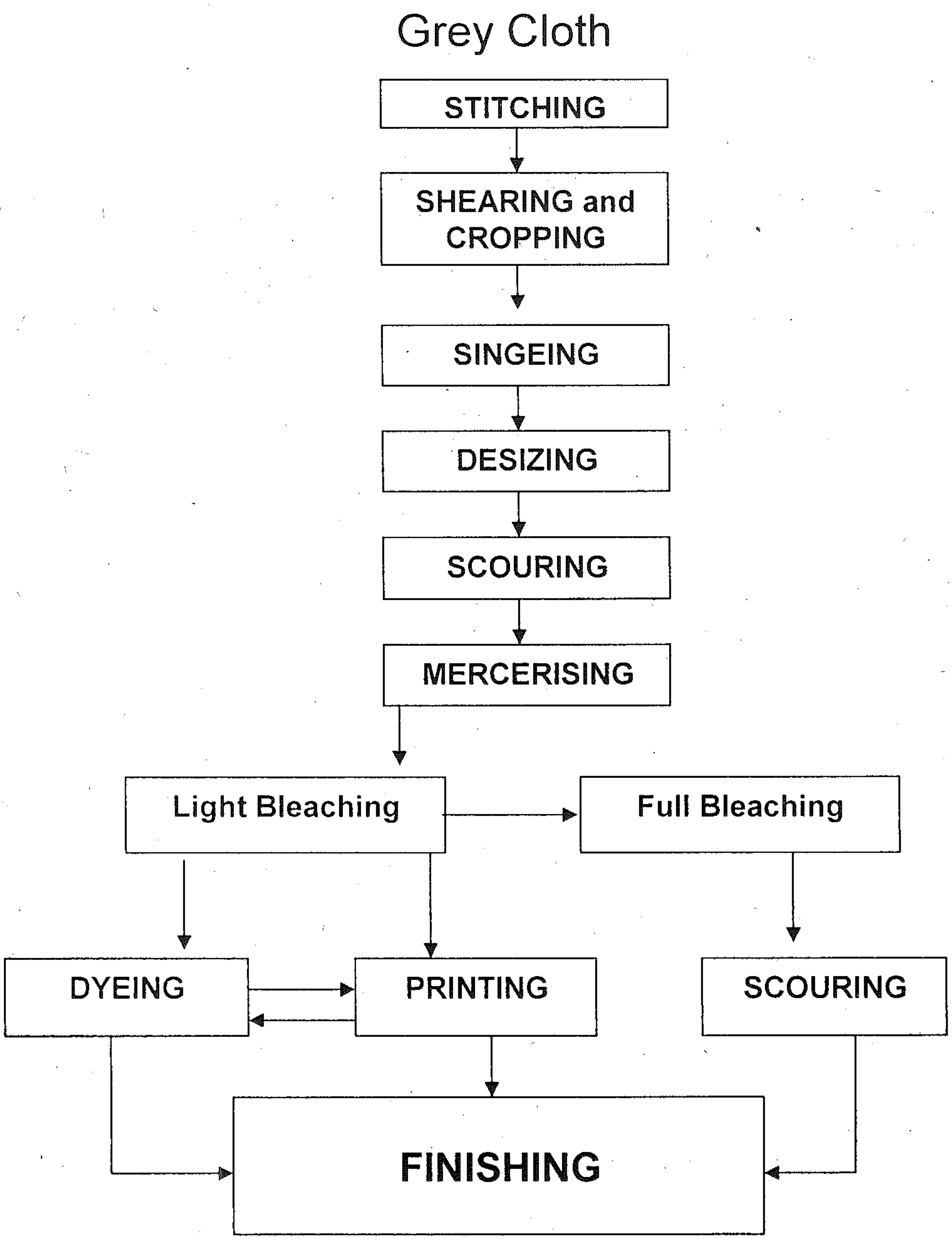
List of Paragraphs

List of Tables

Chapter 4
PROCESSING

4.1 Introduction

The grey cloth is subjected to different processes according to the required end uses of the fabrics. This treatment of grey fabric is called processing. The general flow of processing is as under:



4.1.1 Definitions of Processes

- **Singeing**

Singeing is a mechanical treatment in which no chemical is used. The purposes of this process is to burn out protruding short fibers from fabric surface to get smooth surface of the fabric.

- **Desizing**

Desizing is a process of removal of starch from the grey fabric for which most commonly enzymes are used.

- **Scouring**

Scouring is a process of removal of impurities natural or added from a textile matter.

- **Bleaching**

Bleaching is a process to dis-colour natural coloring matter to get white fabric.

- **Solomatic**

It is a process in which fabric is given combined scouring and bleaching treatment in a single stage.

- **Mercerizing**

Mercerizing is a process to improve luster and dyeability of cotton fabrics.

- **Dying**

Dying is a process in which fabric is colored with the help of certain dyes and auxiliaries.

- **Printing**

Printing is a process in which different colorful patterns are applied on the fabric.

- **Finishing**

Finishing is a process in which certain finishing chemicals are applied on the fabric to improve its serviceability.

4.1.2 Process Route of Fabric During Processing

4.1.2.1 For White Fabric

Singeing → desizing → washing → scouring → bleaching → finishing → calendering/ sanforising → folding

- Sometimes fabric is bleached two times for white appearance if desired results are not obtained by single bleaching.
- During finishing of white fabric leuco or fluorescent whiting agent is also applied on the fabric (0.1—0.15 gm / 100 gm of fabric).
- Calendering and sanforising are two different processes and both may not be applied on the same fabric. So fabric is either calendered or sanforised depending upon the requirements.
- For scouring and bleaching of woven fabrics kier or j-boxes (L-boxes) may be used alternately.

4.1.2.2 For Printed Fabric (With Pigments)

Singeing → desizing → washing → scouring → bleaching → stretching → printing → curing → finishing → calendering / sanforising → folding

- Mostly for fabric to be printed, a combined bleaching and scouring treatment is given that is called solomatic. And process route becomes as

Singeing → desizing → washing → solomatic → stretching → printing → curing → finishing → calendering / sanforising → folding

- Sometimes it is not required to scour and bleach the fabric if fabric ground is fully covered by printing design, so process is shortened as

Singeing → desizing → washing → stretching → printing → curing → finishing → calendering / sanforising → folding

Or

stretching → printing → curing → finishing → calendering / sanforising → folding

4.1.2.3 For Printed Fabric (With Reactive Dyes)

Singeing → desizing → washing → scouring → bleaching → mercerizing → stretching → printing → ageing → washing → finishing → calendering/ sanforising → folding.

- Mercerizing treatment is optional and may be omitted.
- Mostly for fabric to be printed, a combined bleaching and scouring treatment is given that is called solomatic. And process route becomes as

Singeing → desizing → washing → solomatic → stretching → printing → ageing → washing→ finishing → calendering / sanforising → folding.

4.1.2.4 For Dyed Fabric (100 % Cotton With Reactive or Direct Dyes)

Singeing → desizing → washing → scouring → bleaching → mercerizing → dyeing → washing → finishing → calendering / sanforising → folding.

- Dyeing may be done by various techniques. It may be done on winch or soft flow machine in case of knitted fabric. For woven fabric jigger machine is used or alternately if fabric is to be dyed in continuous way pad-thermosol and pad-steam machines are used. In some techniques process involves only one machine either pad-thermosol or pad-steam while some techniques involve both the machines.

4.1.2.5 For Dyed Fabric (P/C With Reactive And Disperse Dyes)

Singeing → desizing → washing → scouring → bleaching → mercerizing → dyeing → washing → finishing → calendering / sanforising → folding.

- In this process route reactive and disperse dyes are applied in a single bath. If these dyes are applied in separate baths route becomes as

Singeing → desizing → washing → scouring → bleaching → mercerizing → dyeing (polyester)→ reduction clearing → dyeing (cotton) → washing → finishing → calendering/ sanforising → folding.

4.1.2.6 For Dyed Fabric (100% Cotton And P/C With Pigments)

Singeing → desizing → washing → scouring → bleaching →dye + finishing → Calendering / sanforising → folding.

- In this process dyeing and finishing is done simultaneously on stenter machine.

4.2 Machines And Processes For Woven Fabrics

4.2.1 Singeing Cum Desizing Machine

Process

singeing and desizing

4.2.1.1 Objectives

- To burn out protruding short fibres from fabric surface to get a smooth surface of fabric.
- To control pilling of blended fabric.
- To remove size applied on warp yarns before weaving so that it may not cause problems of unevenness during dyeing and printing.

4.2.1.2 Description of Processes

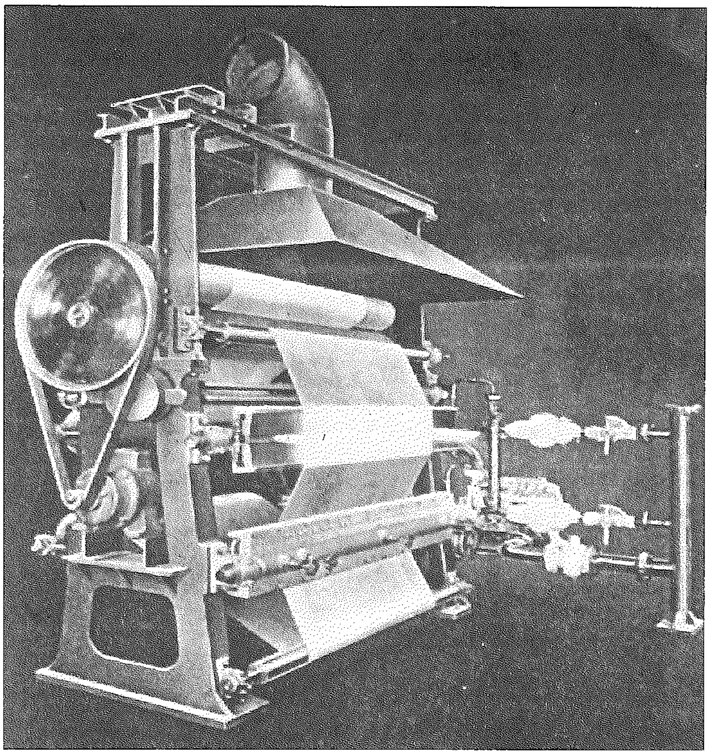
Singeing

It is a process of Burning of short protruding fibres from the surface of woven fabrics to get smooth fabric surface.

Desizing

It is a process of removal of size (starch) from grey fabric which is applied on warp yarns during sizing (a process of application of starch and some other materials on warp yarns before weaving to minimize breakages of yarn during weaving of fabric on loom).

Fabric is passed over a flame at a very high speed to burn the protruding fibres. For this purpose two sets of burners are provided in the machines which impinge intense flame over fabric surface to burn protruding fibres from both sides of fabric. After burners an impregnation bath is provided in the machine. This bath contains desizing liquor which is used for desizing of fabric. Certain types of enzymes are present in this desizing liquor which converts water insoluble ingredients of size into water soluble products. Wet fabric after application of desizing liquor is rolled in the form of a batch and is kept for 6—8 hours. During this time period reactions of enzymes on size ingredients are completed and they become water soluble. After storing this wet fabric for 6—8 hours, it is washed with hot water to remove soluble products.



SINGEING MACHINE

4.2.1.3 Specifications of Singeing Cum Desizing Machine

- Normal rated speed of this m/c is 120 m/m.
- Actual working speed of m/c may vary due to the following factors and ranges b/w 80—120 m/m.

  - Fabric quality
  - Fabric nature
  - No of burners available on the m/c
  - Desired results etc.

- Downtime of m/c is about 2 hours per 24 hours and this also may vary from m/c to m/c and mill to mill.
- Normal range of m/c production capacity per day lies within the range of 1'00'000 to 1'30'000 meters of fabric.

4.2.1.4 Details of Desizing Process

In this process size (starch, which is applied to the warp yarn before weaving) is removed from fabric.

Types Of Desizing

- Rot steeping
- Acid steeping
- Enzyme steeping

Rot steeping

In this process fabric is passed through hot water at a temperature of 60 C. It is then kept in cemented tanks for about 24 hours, during this period starch swells and can be easily removed by washing.

Acid steeping

In this process sulphuric acid (0.25-1%) is added to water at temperature of 40 C. fabric is passed through this solution and squeezed. Then this wet fabric is kept for about 8 to 10 hours in cemented tanks. After 8—10 hours fabric is washed to remove size. This process requires less time as compared to rot steeping.

Enzyme steeping

This is the most commonly used desizing process. In this process fabric is passed through a solution of enzyme desizer and detergent. Fabric is passed through this solution at a temperature of about 65 degree centigrade. The fabric is then placed in the form of batches which are continuously rotated. These are covered with polythene sheets. The rotation is continued for about 8-10 hours. Then fabric is washed.

During the process of desizing when starch is removed from fabric a loss in fabric weight takes place within the range of 8—10 %.

4.2.2 Kier

Process

Batch-wise scouring and bleaching

4.2.2.1 Objectves

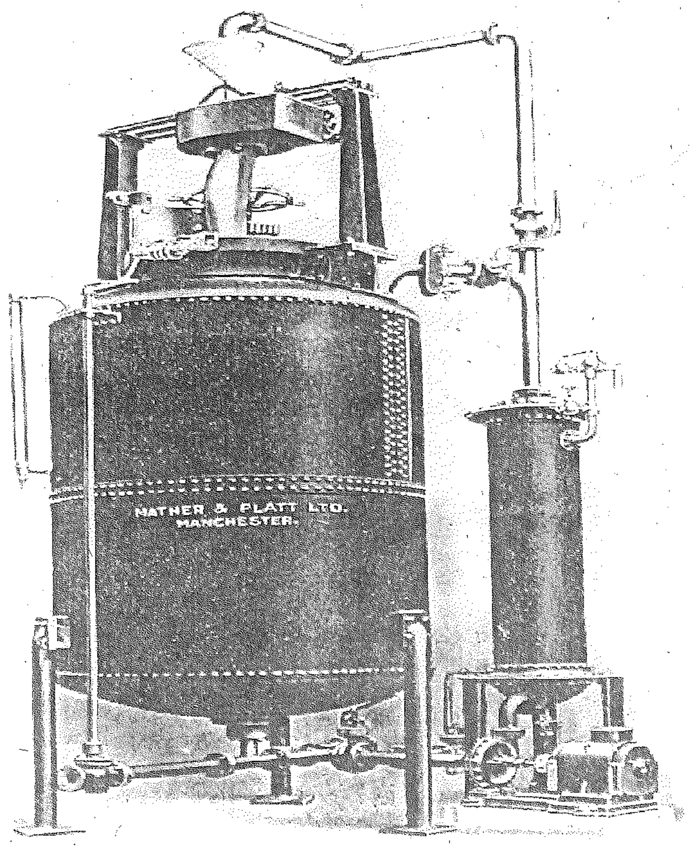
- To remove certain impurities from the fabric such as wax, oils, fats, dirt, dust and mineral matter etc.
- To increase absorbency of fabric so that it can easily be dyed and printed.
- To give fabric white appearance.

4.2.2.2. Description

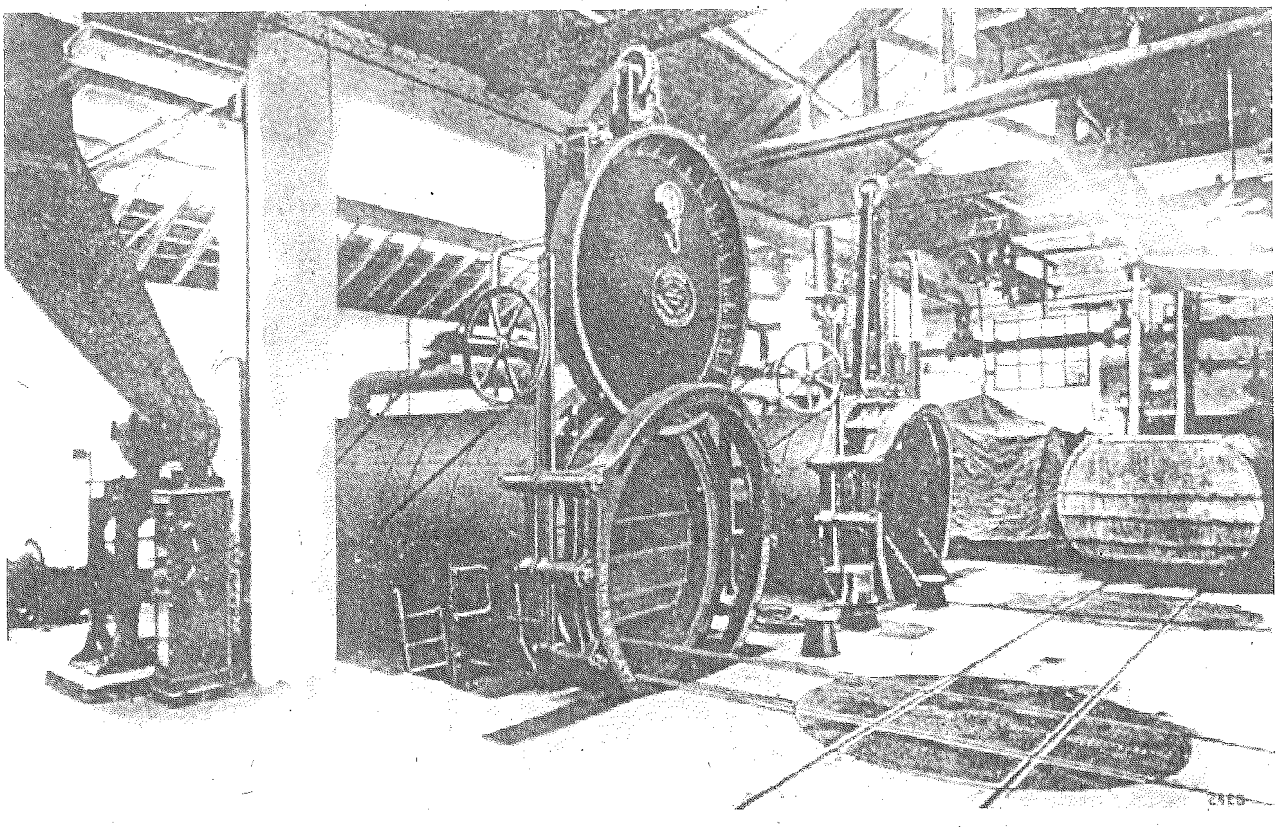
There are two types of kiers

- Low pressure kier
- High pressure kier

Kier can be vertical or horizontal



Vertical Kier



Horizental Kier

4.2.2.3 Scouring

In this process fabric is treated with a solution of caustic soda (NaOH) and soap at a temperature above 100 C for about 6 hours. Fabric is then washed. This process removes natural impurities from fabric such as waxes, oils, fats, dirt, dust and mineral matter etc.

KIER is a cylindrical machine in which fabric is piled in rope form. Fabric is completely immersed in scouring liquor containing caustic soda, soda ash, detergent etc. liquor in the machine can be heated by means of steam. Fabric is treated in the boiling liquor for 6—8 hours depending on quality of cloth and required results. After completion of treatment fabric is washed and unloaded.

High pressure kier is same in construction with an additional lid with the help of which machine can be closed air tight to get higher temperature/pressure inside the machine.

4.2.2.4 Bleaching

In this process fabric is treated with a solution of bleaching agent (hydrogen peroxide) at a temperature of above 100 C for about 2 hours. Fabric is then washed and unloaded. This process is used to remove natural coloring matter of fibre. In earlier days bleaching process was carried out by using hypochlorite bleaching agents like sodium hypochlorite and calcium hypochlorite. But this process has become obsolete now and is used rarely in local industry.

4.2.2.5 Specifications of Kier Machine

- Kiers of different models have loading capacity of one ton, 2 ton, 3 ton, 3.5 ton etc.

- Total time required for the process of scouring lies within the range of 6—8 hours.
- Total time required for the process of bleaching lies within the range of 2—3 hours.
- Down time of m/c is 6—8 hours which is mainly due to loading and unloading of fabric.

4.2.3 J-Box, L-Box, Continuous Steamer

Process

Scouring and bleaching

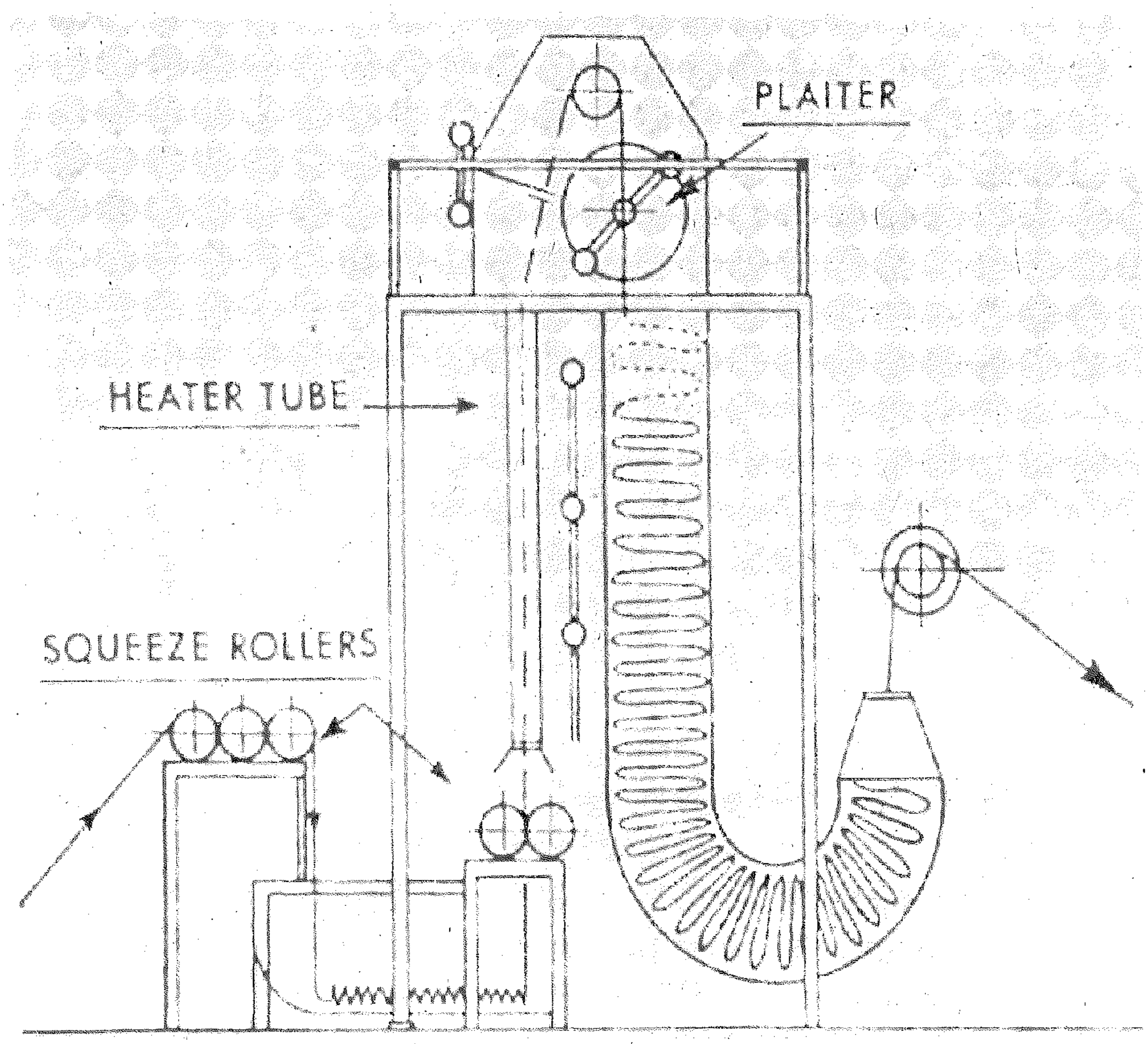
4.2.3.1 Objectives

- To remove certain impurities from the fabric such as wax, oils, fats, dirt, dust and mineral matter etc.
- To increase absorbency of fabric so that it can easily be dyed and printed.
- To give fabric white appearance.

4.2.3.2 Description

These machines are used for continuous scouring and bleaching of woven fabrics. Fabric is passed through scouring liquor or bleaching liquor and then in J-BOX, L-BOX or STEAMER for about 60-90 minutes at a temperature of 90-100 C. Fabric is then washed .This process is much faster than the kier scouring and bleaching and is used for obtaining higher production. Machine consists of washing tanks for washing of desized fabric which is then passed through a tank having scouring or bleaching liquor depending upon the nature of process. Fabric is padded enters into a steamer, j-box or L-box for steam treatment. Fabric completes its passage in steamer in 60—90 minutes depending upon quality of fabric and results required. After steamer, washing tanks are provided for washing of scoured or bleached fabric. At the end of machine, dryers are provided for drying of fabric. Fabric runs in the form of open web in these machines.

J-box and L-box are same in construction with the exception that shape of steamer is like English words J and L.



J-BOX (LINE DIAGRAM)

4.2.3.3 Specifications of J-Box, L-Box Etc

- Normal rated speed of machine is 120 m/m.
- Actual working speed of m/c is 80—100 m/m for light wt. Fabrics.
- Actual working speed is 60—80 m/m for heavy wt. Fabrics.

- Downtime of m/c is 2—3 hours per day.
- Production capacity of m/c lies within the range of 80,000 to 125,000 meters of fabric per day.

4.2.4 Mercerising Machine

Process

Mercerizing

4.2.4.1 Objectives

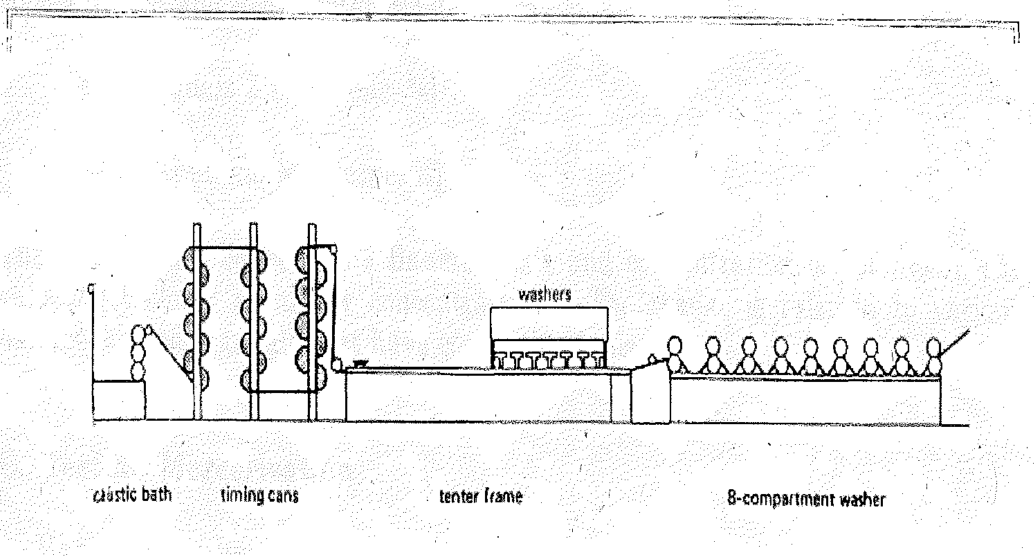
- To increase luster of fabric
- To improve dyeability of fabric

4.2.4.2 Description

There are two types of mercerizing machines.

- Chain type or stenter type
- Chainless mercerizing machine

Figure 29. Chain Mercerizing Range



This process is particularly used for cotton fabrics for giv it lustre and to increase its dyeability.In this process fabric is treated with caustic soda (NaOH) solution of about 200-300g/l at a temperature less than 20 C for about 30-35 sec.After this treatment fabric is washed with water.

In chain type, mercerizing machine fabric is gripped at its selvedge into clips of two parallel chains and is treated with caustic solution in slack form. While in chainless mercerizing m/c fabric is treated with caustic soda solution under high tension.

4.2.4.3 Specifications of Mercerising Machine

- Normal rated speed of m/c is 60—80 m/m
- Normal working speed of m/c is 50—60 m/m for light wt. Fabrics.
- Normal working speed of m/c is 30—40 m/m for heavy wt. Fabrics.
- Downtime of m/c is 2—3 hours per day
- Therefore, the average production capacity of m/c is 60,000 to 80,000 meters of fabric per day

4.2.5 Pad Thermosol

Process

Dyeing

4.2.5.1 Objectives

To dye natural and synthetic fabrics and their blends in a continuous way by pad—dry—cure technique to meet high production demands.

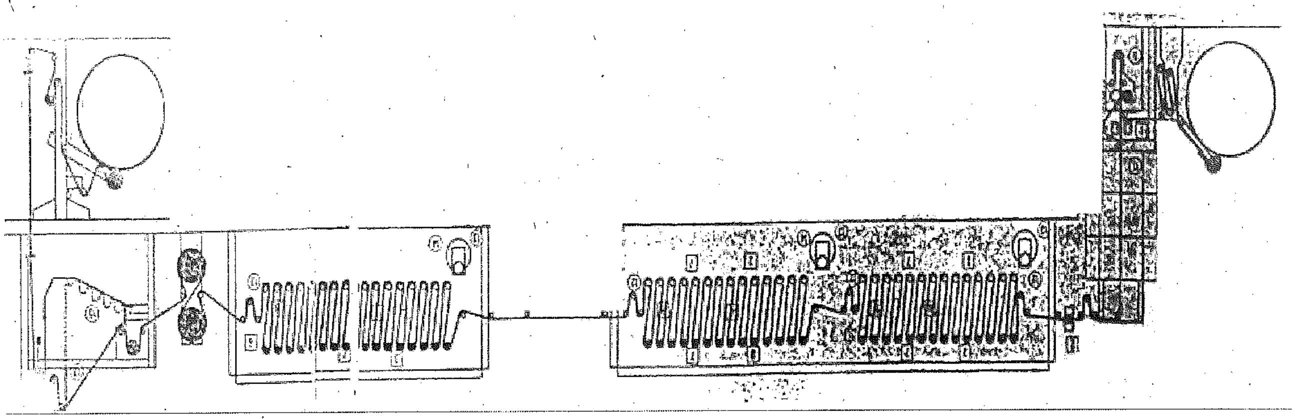
4.2.5.2 Description

This machine is used for continuous dyeing of woven fabrics.

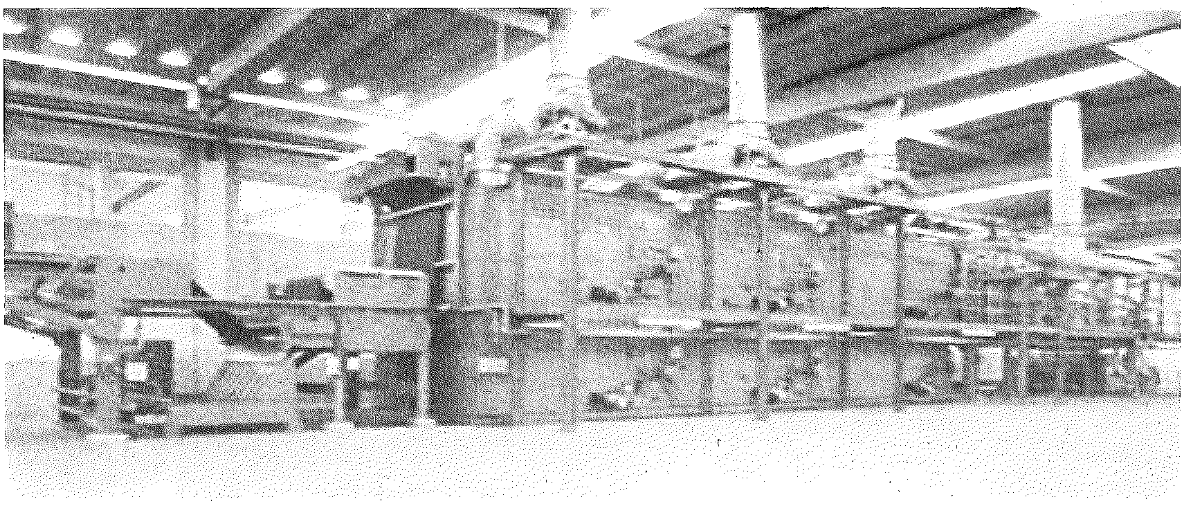
Fabric is padded through a solution containing dye and other auxiliaries and is dried by passing through infra red dryers or by passing over drying cylinders or by passing through drying chamber depending upon the model and design of machine. When the fabric is completely dried it is subjected to a high temperature (150—210 C) treatment called curing or thermosoling in thermosoling chambers. Temperature of chambers for curing depends upon dyes and fabric type. Speed of machine is also varied depending upon dyeing process, dyes, fabric type etc.

Different types of machines are presently in use in local industry. These machines may vary in following respects.

- Maximum width of fabric that can be dyed on machine.
- No of drying + curing chambers available on the m/c.
- Cloth content of chambers.
- Heating system of the chambers of m/c.
-



Line Diagram Of Pad Thermosol



Pad Thermosol Dyeing Machine

4.2.5.3 Specifications of Pad Thermosol Dyeing Machine

- Rated speed of m/c is 80—100 m/m
- Working speed is 60---80 m/m for vat dyeing.
- Working speed is 40—50 m/m for light wt. fabrics in case of reactive dyeing.
- Working speed is 25—35 m/m for heavy wt. fabrics in case of reactive dyeing.
- Downtime of m/c lies within the range of 4—6 hours however it is highly variable depending upon lot size of fabric.
- Production capacity lies within the range of 25'000 to 72'000 depending upon cloth construction, nature of process and model of m/c.

4.2.6 PAD STEAM

PROCESS

Dyeing, r/c wash, developing

4.2.6.1 Objectives

- To dye natural fabrics in a continuous way by pad—steam technique to meet high production demands.
- To cautisize cotton fabric in order to improve its dyeing behavior.
- To give reduction clearing treatment to p/c fabric.
- To develop vat dyed fabric to fix dyes on it.
- To develop reactive dyed fabric if dyed by pad—dry—pad chemical technique.

4.2.6.2 Description

This machine is also used for continuous dyeing of woven fabrics.
Fabric is padded through a solution containing dye and other auxiliaries. The fabric is then subjected to a steaming treatment for 40—120 seconds depending upon the fabric quality and other factors. For this purpose, a steamer is provided on the m/c with steam environment at a temperature of 100—102 C. After steamer, a range of washing tanks is available for washing of unfixed dyes.
This m/c can also be used for developing of vat-dyed fabrics on pad thermosol m/c by pad – dry – cure – pad – steam – technique.

4.2.6.3 Specifications of Pad Steam Dyeing Machine

- Rated speed of m/c is 80—100 m/m
- Working speed of m/c is 60—80 m/m for light wt. fabric.
- Working speed of m/c is 40—50 m/m for heavy quality fabrics.
- Downtime of m/c is 4—6 hours per day.
- Normal production capacity of m/c lies within the range of 40,000 to 60,000 meters of fabric per day.

4.2.7 Jigger Dyeing Machine

Process

Dyeing

4.2.7.1 Objectives

- To dye natural and synthetic fabrics and their blends in batch wise manner.
- To develop vat dyed fabric.

4.2.7.2 Description

There are two types of jigger machines.

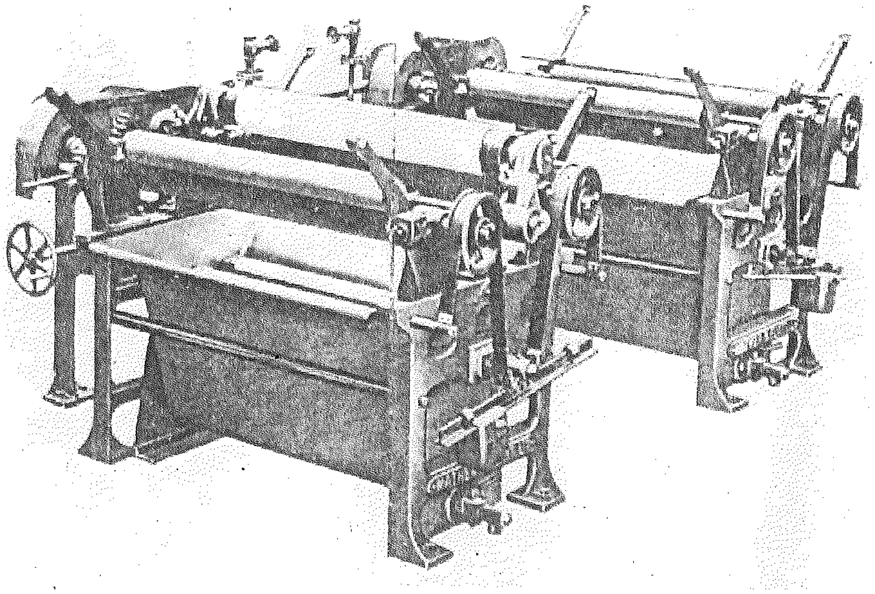
- Low pressure
- High pressure

Liquor is prepared in the jigger tank and fabric is allowed to rotate through it for a specific time, which varies according to the type of dye and fabric. High-pressure jiggers are used for the dyeing of synthetic fabrics.

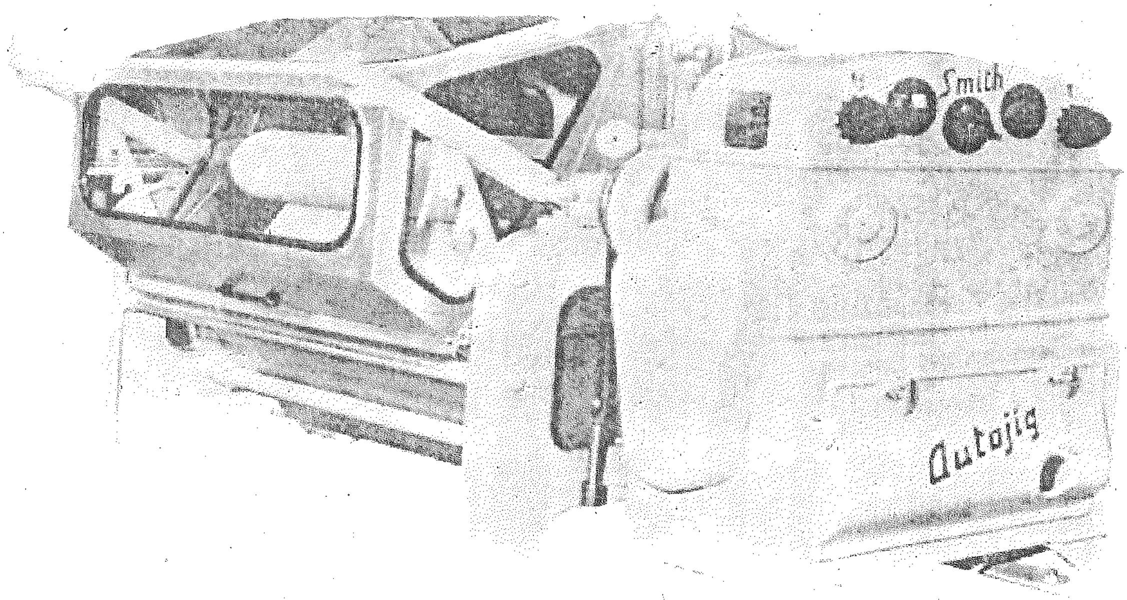
Low pressure jigger is used for dyeing of cotton fabrics.

Fabric is loaded in the form of batch on beam at one side and then the fabric is allowed to pass through the dyeing liquor which is present in the trough and then is loaded on another beam present on the opposite side. This movement of fabric from one beam to the other through trough is called one END. In this machine the dyeing time depends on the number of ends. No of ends are decided according to nature of process and quality and quantity of fabric.

High pressure jigger is similar in construction with the exception that it is provided with a lid to tightly close the jigger in order to achieve high temperatures more than 100C which is required for dyeing of certain synthetic fabrics like polyester.



Low Pressure Jigger Machine



High Pressure Jigger Machine

4.2.7.3 Specifications of Jigger Machine

- Capacity of m/c may vary from m/c to m/c and is affected by cloth quality. Normal range of m/c capacity is 700---2500 meters.
- Dyeing time of each lot depends upon batch size and results required.
- Downtime of m/c is 4—6 hours per day.
- Production capacity of m/c is 4,000--- 6,000 meters per day.

4.2.8 Washing Range

Process

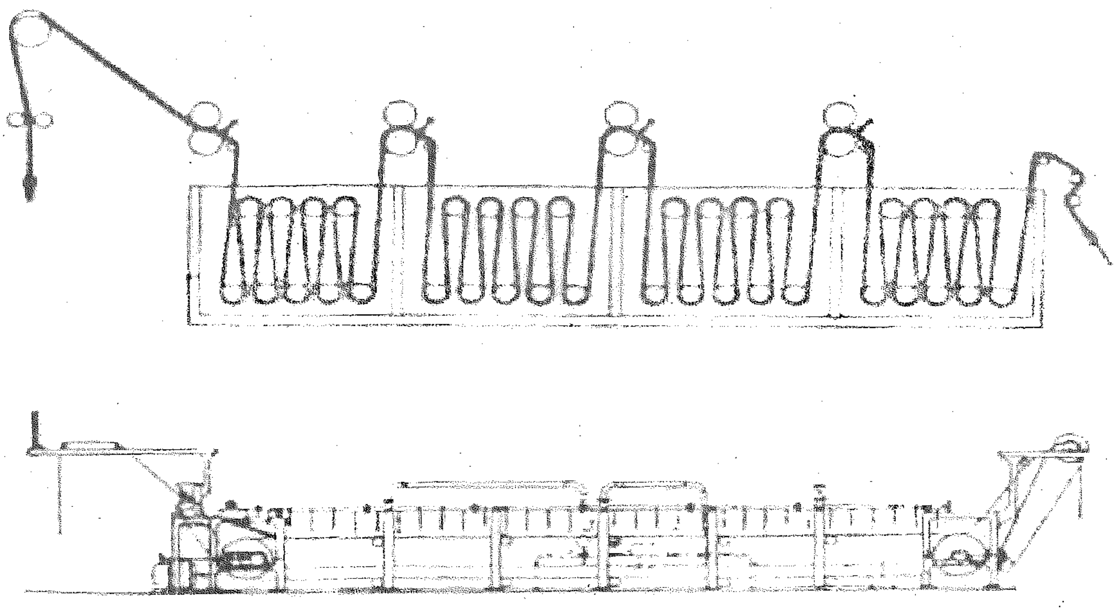
Washing

4.2.8.1 Objectives

To wash dyed and printed fabrics in order to remove unfixed dye.

4.2.8.2 Description

Used for the washing of fabrics after dyeing or reactive printing. It has 3 or more washing tanks having hot and cold water. In some washing processes the fabric is passed first through cold water then through hot water and again through cold water according to the requirements of the washing process. At the end of the m/c dryers are provided for drying of wet fabric



Washing Range

4.2.8.3 Specifications of Washing Range

- Rated speed of m/c is 100---140 m/m.
- Working speed of m/c is 80—100 for light wt. fabrics
- Working speed of m/c is 60—80 m/m for heavy wt. fabrics
- Downtime of m/c is 4---6 hours.
- Production capacity of m/c lies within the range of 60,000 to 100,000 meters.

4.2.9 Rotary Screen Printing Machine

PROCESS

Printing

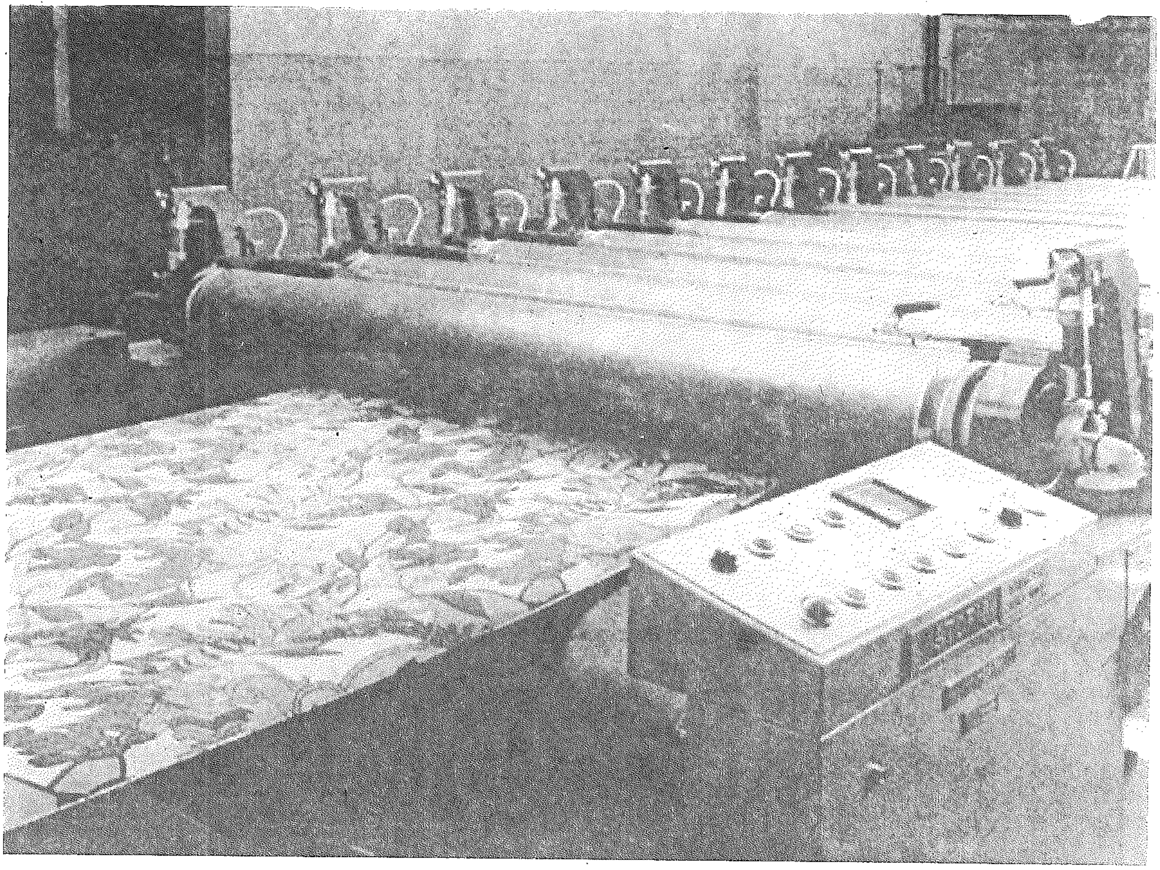
4.2.9.1 Objectives

To print fabric with different printing styles such as direct, discharge, resist etc.

4.2.9.2 Description

This machine is extensively used for printing of fabrics. Machine has an arrangement of metallic screens, which can rotate over a blanket. Fabric is glued to the blanket and passes below the rotating screens. Inside the screens color paste is present which comes out through fine pores of screen. As fabric passes below these screens, it is printed. Then fabric enters into drying chamber where fabric is dried by hot air. This m/c is used for producing fine designs and a maximum of 16-coloured designs can be produced. This is a high-speed machine and gives high production as compared to other printing machines. Different types of rotary screen printing machines are presently in use in the local industry. These machines may vary in following respects.

- Maximum no of screens that can be arranged on the m/c.
- Maximum repeat size of printing design that can be printed on the m/c. (depends upon the screen diameter).
- Maximum width of fabric that can be printed on the m/c.
- Cloth content of dryer.



Rotary Screen Printing Machine

4.2.9.3 Specifications of Rotary Screen Printing Machine

- Speed of m/c is 60—80 m/m
- Working speed of m/c is 40—60 m/m
- Downtime of m/c is 4---6 hours per day.
- Production capacity of m/c lies within the range of 25,000 to 80,000 meters per day.

4.2.10 Roller Printing Machine

Process

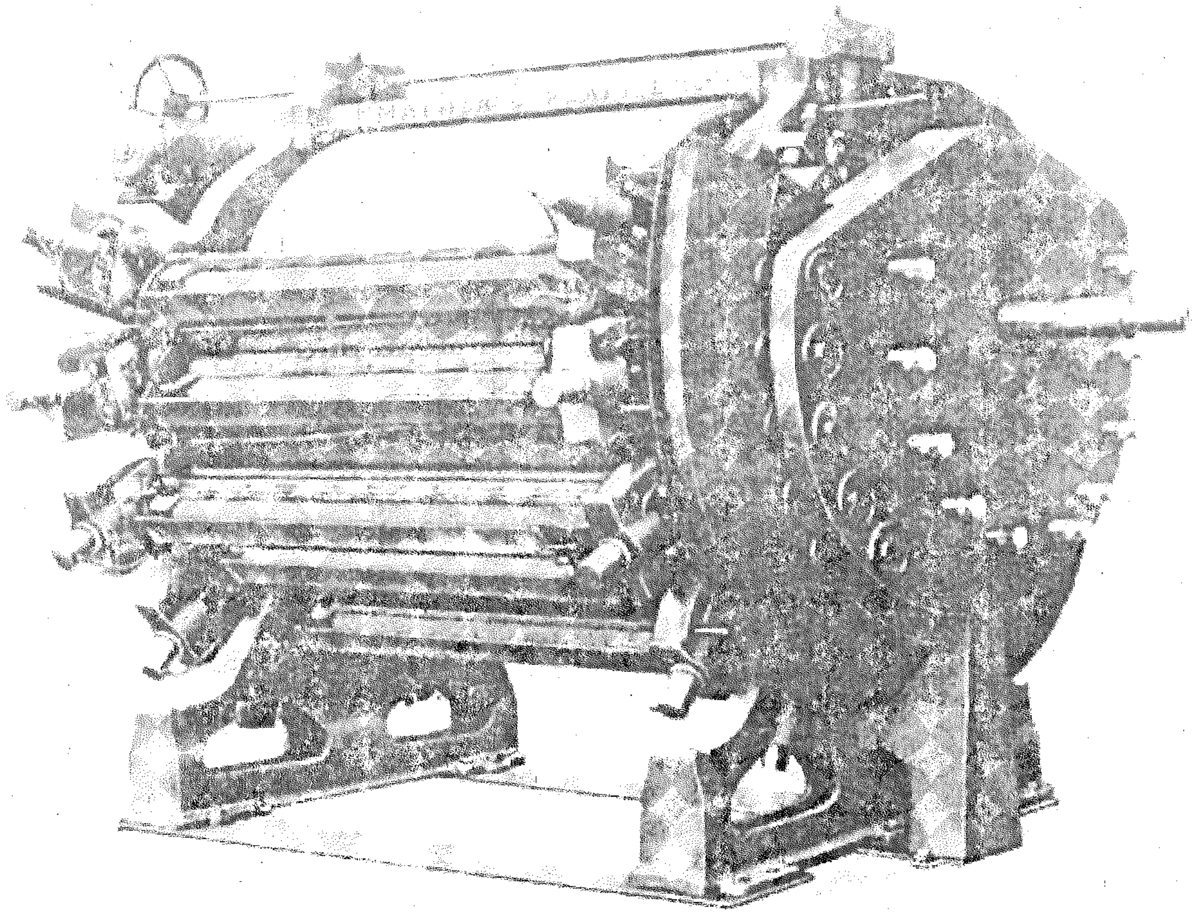
Printing

4.2.10.1 Objectives

To print fabric with different printing styles such as direct, discharge, resist etc.

4.2.10.2 Description

This machine is also used for printing of fabrics. It has engraved metal rollers. It is difficult to produce fine designs with this machine. It is an old machine and has become obsolete now.



Roller Printing Machine

4.2.11 Table Printing

Process

Printing

4.2.11.1 Objectives

To print fabric with different printing styles such as direct, discharge, resist etc.

4.2.11.2 Description

This is used for manual printing of fabrics. It gives very low production. Fabric is spread over tables made of cement. Then fabric is printed manually with the help of flat screens.

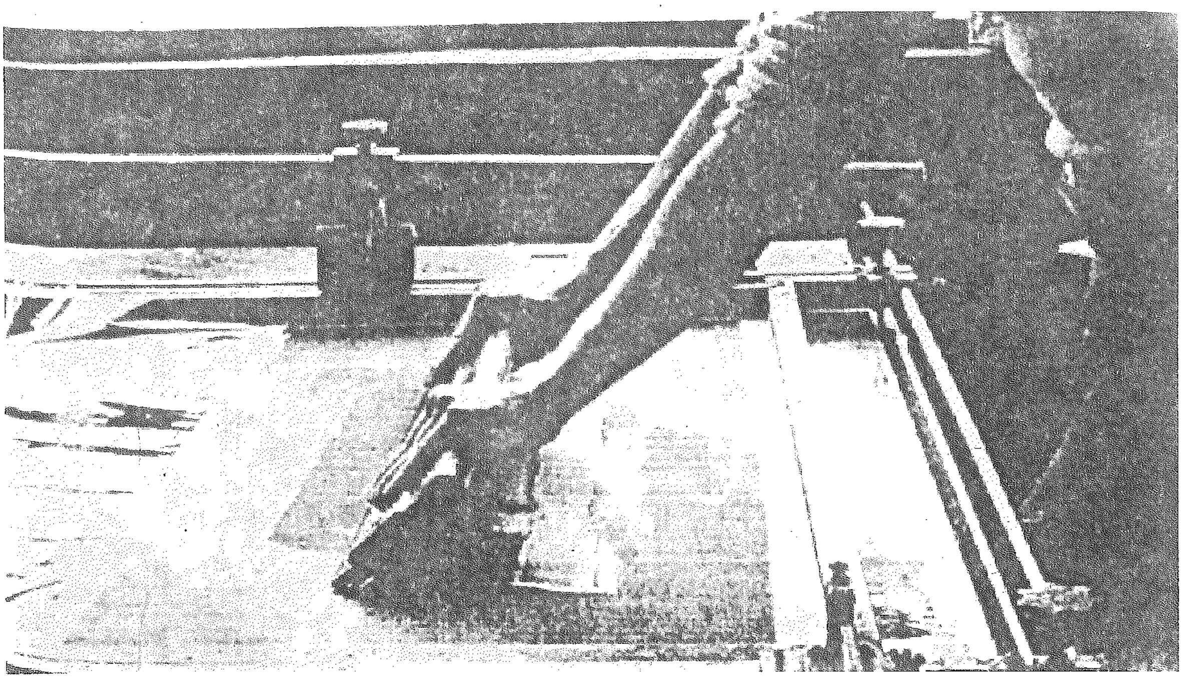
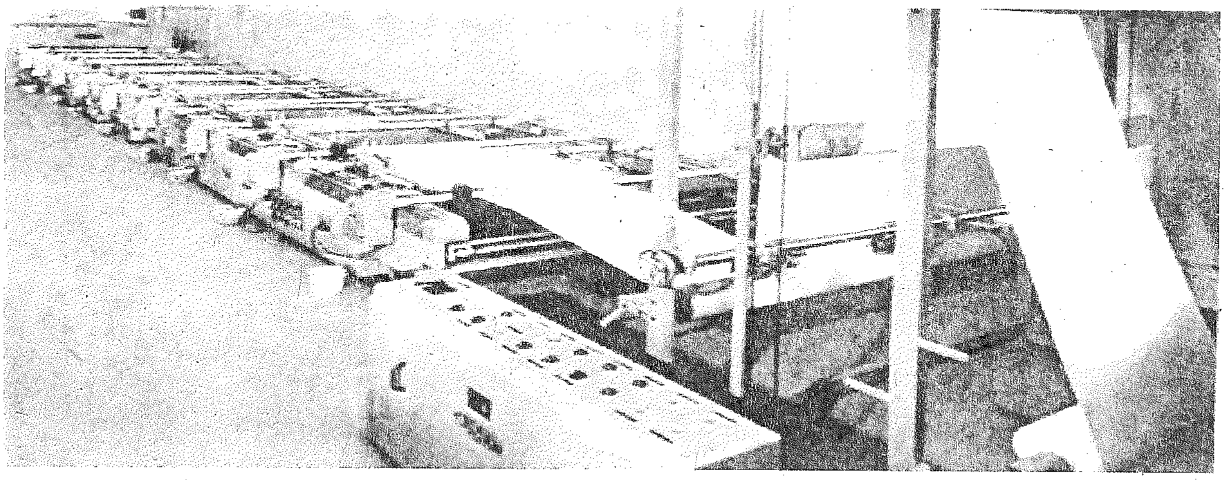


Table Printing

4.2.12 Flat Bed Printing Machine

This machine is also used for printing of fabrics. It has flat screens with which large repeat designs can be easily produced. These screens are lifted and lowered automatically. Large repeat designs can be printed on this m/c. Production capacity of m/c lies within the range of 10,000 to 20,000 m/day.



Flat Bed Printing Machine

4.2.13 Printing Paste

For printing of fabrics we have to prepare printing paste .Its contents depend upon the dyes or pigments used .For printing cotton fabrics and using reactive dyes for this purpose we use the following chemicals

- DYES
- SODIUM BICARBONATE
- RESIST SALT
- THICKNER

4.2.14 Curing Machine

Process

Curing

4.2.14.1 Objectives

- To cure pigment printed fabric in order to fix pigment applied.
- To cure 100 % cotton fabric in order to burn polypropylene impurities which cause uneven dyeing effects.
- To cure fabrics after resin finishing in order to get permanent results of resin finishing.

4.2.14.2 Description

After pigment printing pigment has to be fixed on the fabric. For this purpose we use curing machine .In this machine fabric is subjected to a temperature of 140—180 C and pigment is fixed during this process.

4.2.14.3 Specification of M/C

- Rated speed of m/c is 60—80 m/m
- working speed of m/c is 40—60 m/m
- Downtime of m/c is 2—4 hours per day
- Production capacity of m/c is 45,000 to 80,000 meters per day.

4.2.15 Ager

Process

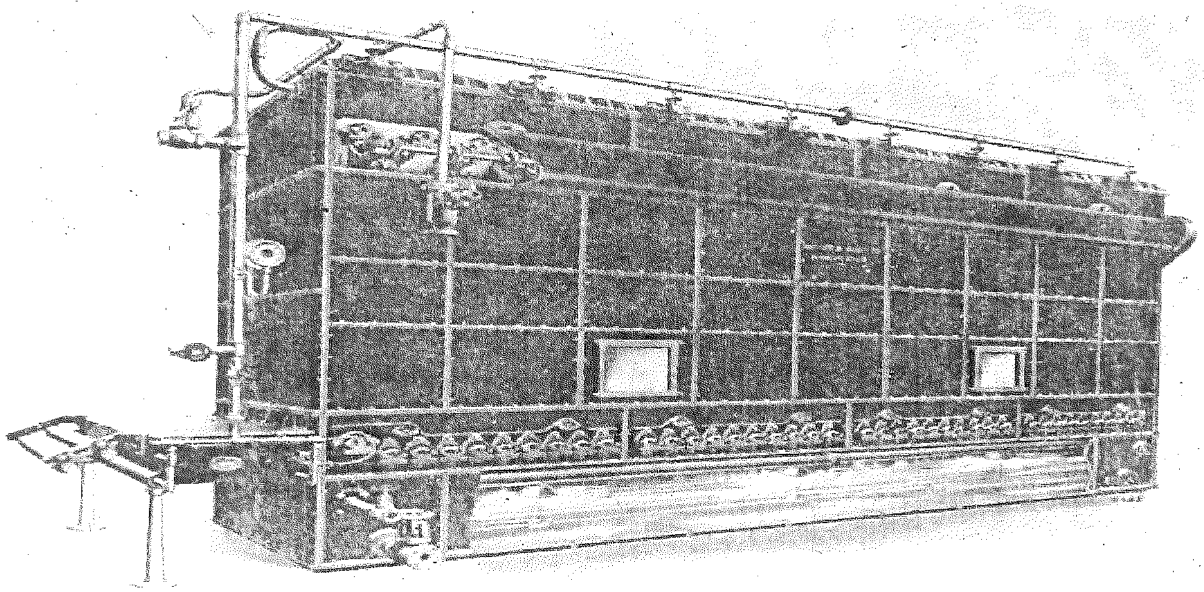
Ageing

4.2.15.1 Objectives

To give ageing treatment (steam treatment) to reactive printed fabric in order to fix the reactive dyes.

4.2.15.2 Description

This machine is used for fixation of reactive dyes on printed fabrics. Machine consists of a large chamber in which fabric is subjected to steam environment during which reactive dyes in the printed portion of fabric get fixed.



Ager Machine

4.2.15.3 Specifications of Ager Machine

- Rated speed of m/c is 30—40 m/m
- Normal working speed of m/c is 15—20 m/m
- Downtime of m/c is 1—2 hours per day
- Production capacity of m/c is 20,000 to 25,000 meters per day.

4.2.16 Stenter Machine

Process

Finishing, heat setting, width setting

4.2.16.1 Objectives

This machine is used for

- Applying different finishes to the fabrics, e.g.
    - softeners
    - Water repellent finishes
    - Fire retardant finishes
    - Stiff finishes

- Moth proof finishes etc.
- Weft straightening
- Heat setting of synthetic fabrics
- Width setting

4.2.16.2 Description

Fabric is padded through liquor containing finishing agents in the first portion of m/c. then this wet fabric enters the mahlo system where weft straightening of the fabric takes place. Then comes the next portion of m/c that consists of drying chambers. During its passage through chambers, fabric is held within clips or pins from both the selvedge sides. By controlling the inter-distance of two sides of chains, we can set the fabric at desires width.

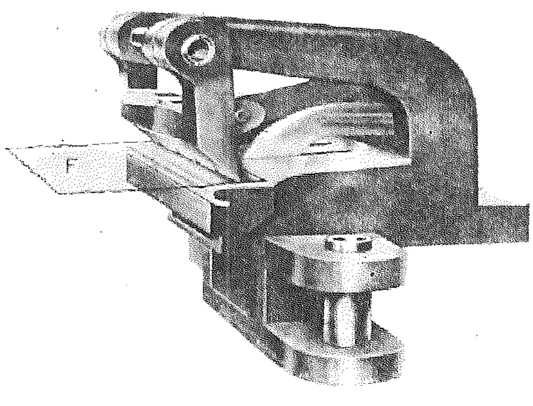
Stenter machines in industry may differ from each other in following respects.

Pin type or clip type

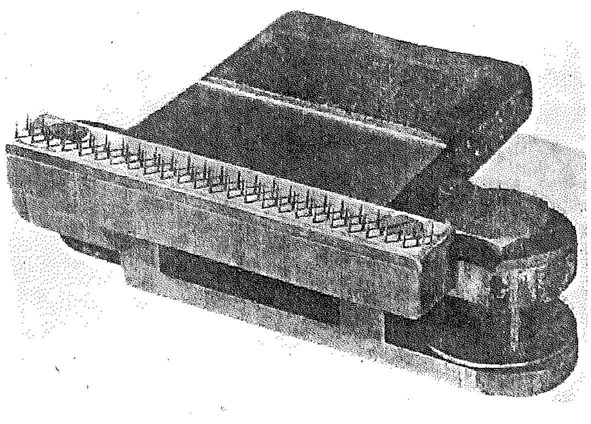
No of chambers on the m/c in which fabric is subjected to heat treatment.

Cloth content of chambers.

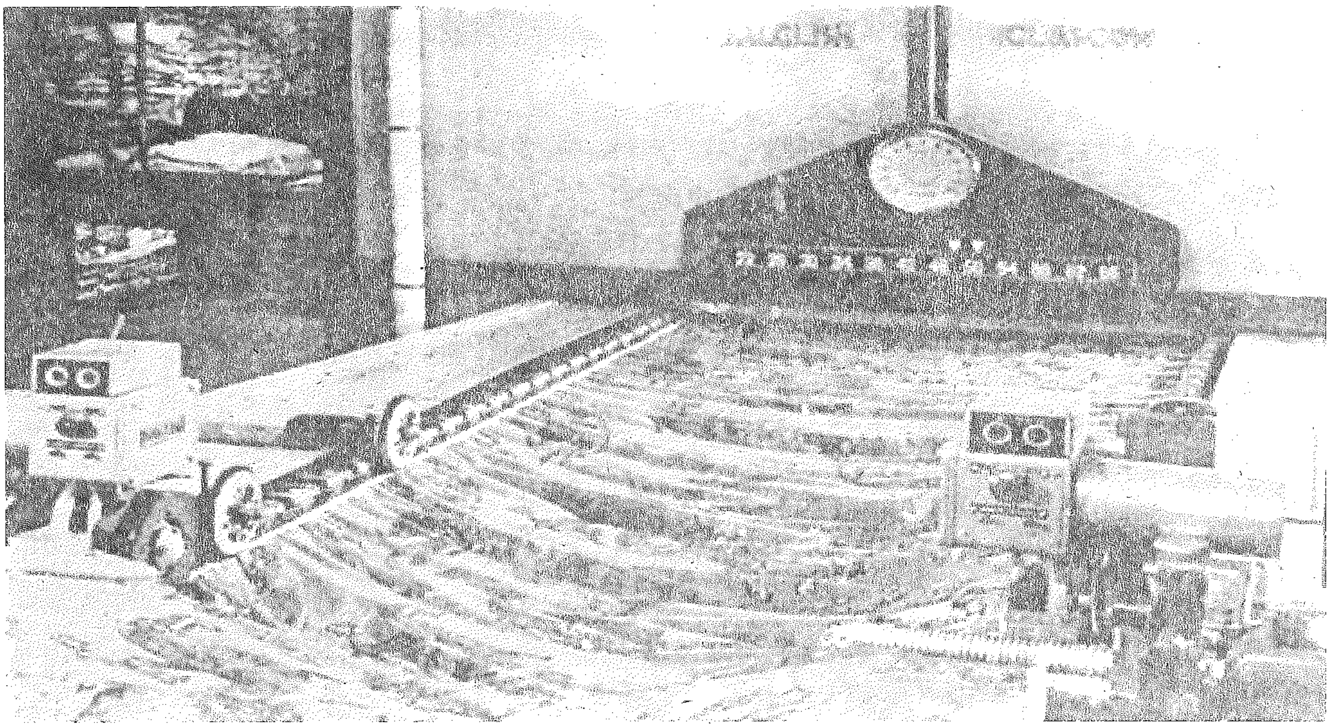
Mahlo system is provided on the m/c for weft straightening.



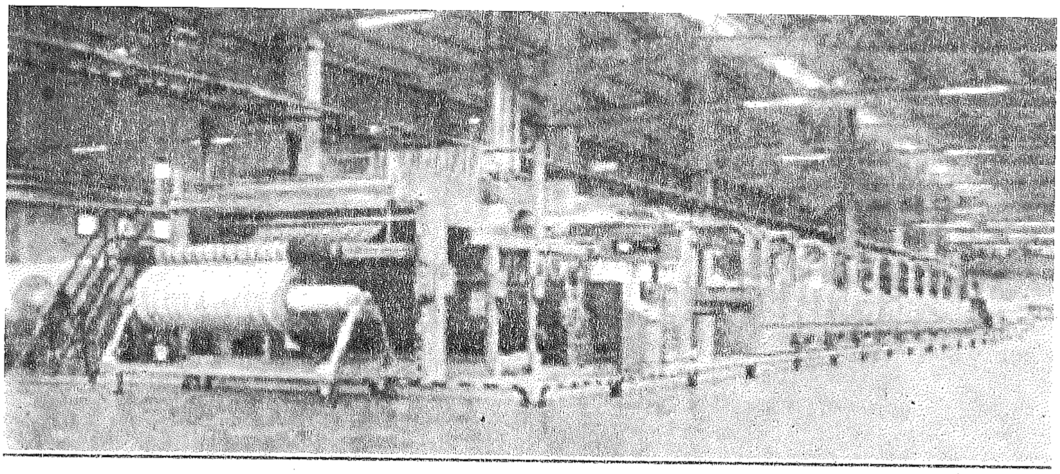
Clips Of Stenter



Pins Of Stenter



Stenter Machine



4.2.16.3 Specifications of Stenter Machine

- Rated speed of m/c is 100—140 m/m.
- Working speed of m/c is 80—100 m/m
- Downtime of m/c is 1—2 hours per day
- Production capacity of m/c is 80,000 to 100,000 meters per day

4.2.17 Calender Machine

Process

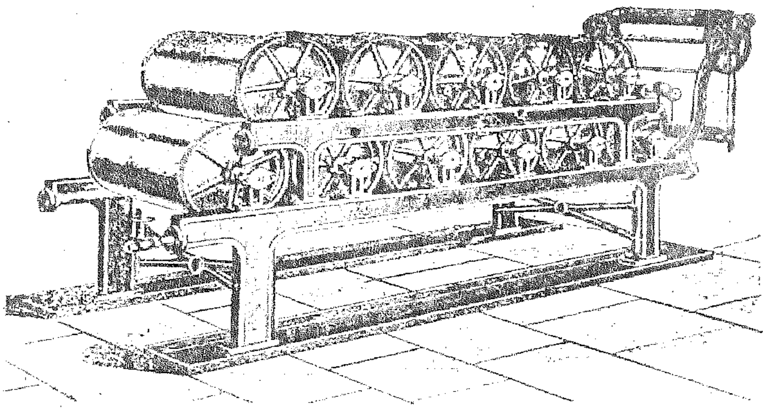
Calendaring

4.2.17.1 Objectives

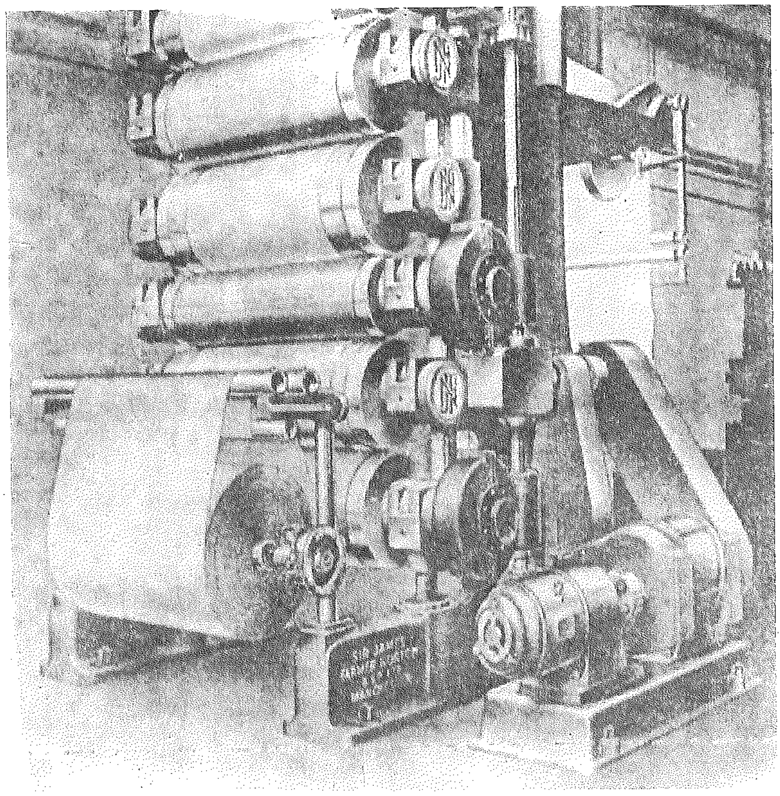
To impart lustre to fabric

4.2.17.2 Description

This machine is used for calendering of fabrics after dyeing and printing. It gives smoothness and lustre to the fabric. In this machine fabric is passed between set of rollers some of which are heated. This gives smoothness to the fabrics. Calender machines may differ from one another due to different number of bowls or rollers.



Horizental Calender Machine



Vertical Calender Machine

4.2.17.3 Specifications of Calender Machine

- Rated speed of m/c is 80—100 m/m
- working speed of m/c 40—60 m/m
- Downtime of m/c is 2—4 hours per day
- Production capacity of m/c is 40,000 to 60,000 meters per day.

4.2.18 Sanforizing Machine

Process

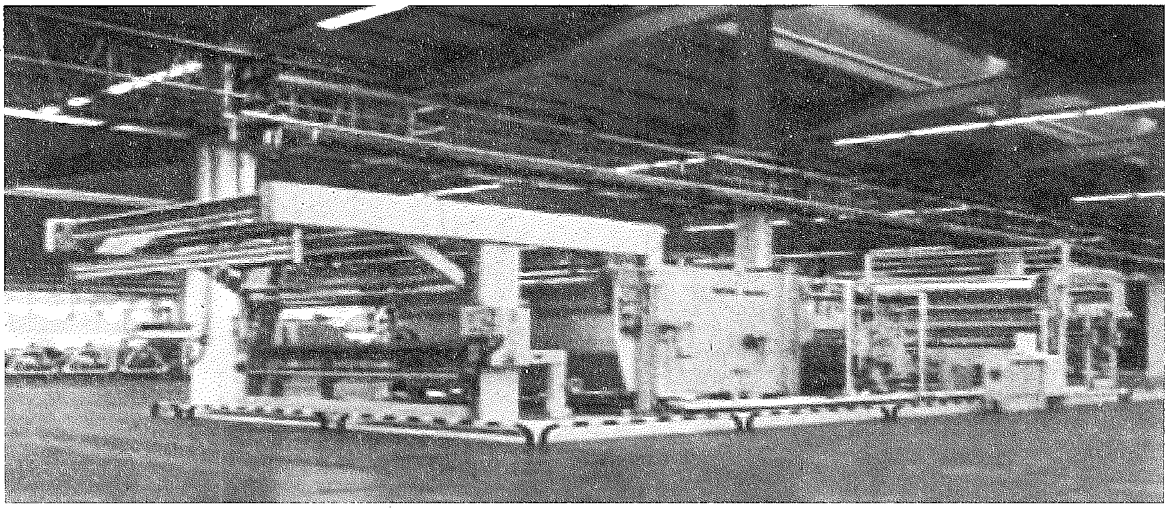
Sanforising

4.2.18.1 Objectives

To pre shrink fabric so that it may not shrink during end use.

4.2.18.2 Description

This machine is used to control shrinkage of the cotton fabrics. In this machine fabric is passed between a steam heated roller and rubber belt of about 1-2 inch thickness. During this passage fabric gets shrunk. This process helps to avoid shrinkage of fabric during its end use.



Sanforizing Machine

4.2.18.3 Specifications of Machine

- Rated speed of m/c is 60—80 m/m
- working speed of m/c is 40—60 m/m
- Downtime of m/c is 4—6 hours per day
- Production capacity of m/c is 35,000 to 45,000 meters per day

4.2.19 Raising Machine

Process

Raising

4.2.19.1 Objectives

To raise the fabric in order to get hairiness on the fabric surface.

4.2.19.2 Description

This m/c has a large drum having metallic card on i.e. a drum having metallic needles on its surface to pluck fibres from the surface of the fabrics to give it hairy appearance.

Raising Machine

4.2.19.3 Specifications of Raising Machine;

- Rated speed of m/c 40—60 m/m
- Working speed of m/c is 30—40 m/m
- Downtime of m/c is 1—2 hours per day
- Production capacity of m/c is 35,000 to 50,000 meters per day

4.2.20 Emerising Machine

4.2.20.1 Objective

This machine has a roller called emery roller which is used to give fabric a slight hairy appearance. Fabric is passed over this roller to it desired affect.

4.2.20.2 Specifications of Machine

- Rated speed of m/c is 40—60 m/m
- Normal working speed of m/c 15—20 m/m
- Downtime of m/c is 1—2 hours
- Production capacity of m/c is 18'000 to 25'000 meters per day

4.3 Machines And Processes For Knitted Fabrics

4.3.1 Soft Flows

4.3.1.1 Objective

In case of knitted fabrics these machines are used for almost all wet processes like scouring, bleaching, dyeing and for applying finishes.

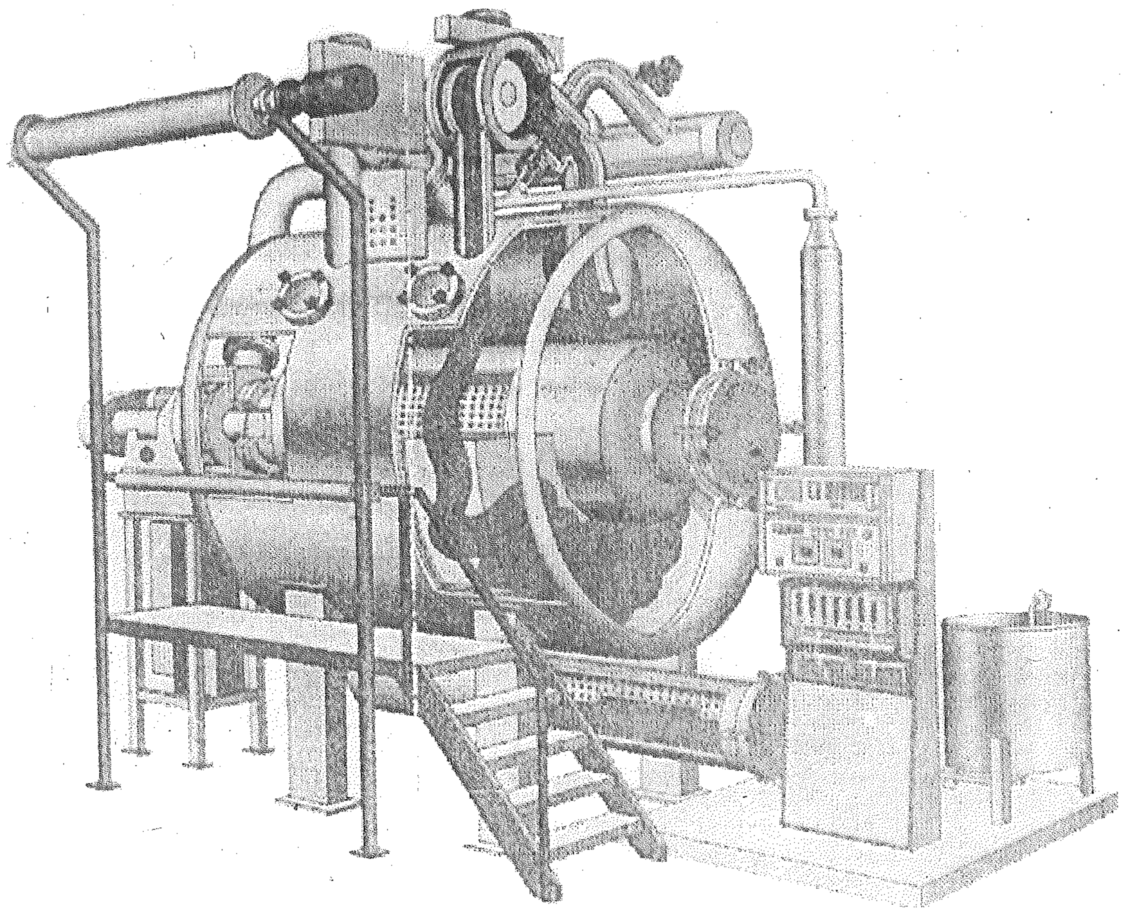
4.3.1.2 Description

The total process of scouring, bleaching, dyeing and finishing takes almost 8hours.There are two types of soft flows

- High pressure
- Low pressure

High-pressure soft flows are used for dyeing of synthetics whereas low-pressure soft flows are used for dyeing of cotton fabrics.

In case of knitted fabrics, the production is determined in terms of weight of the fabric and not in term of its length.



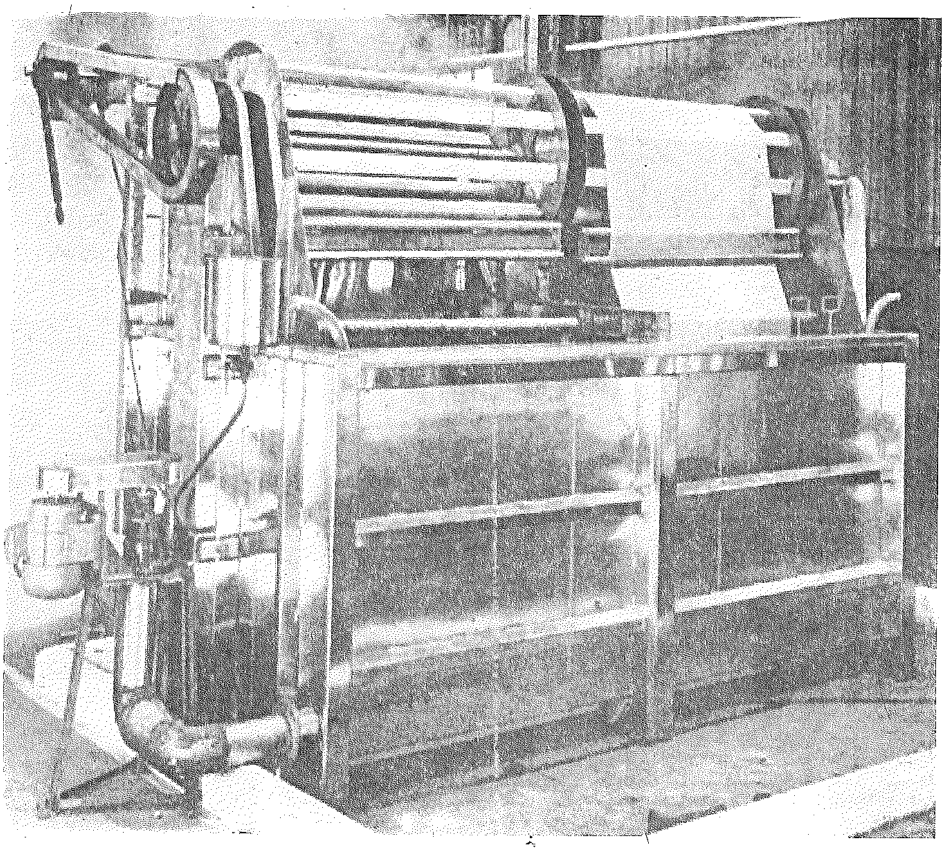
Soft Flow

4.3.1.3 Specifications For Soft Flow Machine

- Types of soft flows=2-6 tubes
- Souring, bleaching, dyeing=6-8hrs(depending upon the quality of fabric and depth of shade)
- Down time=1-2hrs
- Production capacity=300-900kg
- Production /day=900-2700kg

4.3.2. Winches

These machines are also used for souring, bleaching, dyeing and finishing of knitted fabrics.



Whinch

4.3.2.1 Specifications of Whinch Machine

- Capacity=10kg-200kg
- Production/day=mostly used for dyeing of samples or small quantity of fabric
- Scouring,bleaching,dyeing=6-8hrs

4.3.3 Dyrers (Horizontal And Vertical)

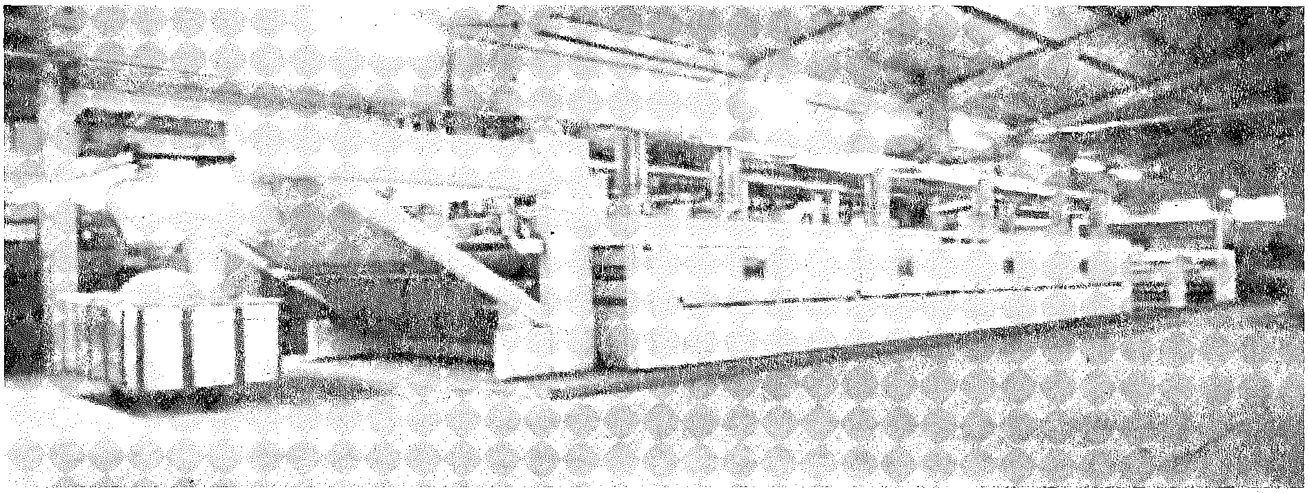
4.3.3.1 Objective

These machines are used to dry the fabrics after wet processing.

4.3.3.2 Description

There are two types of dryers

- Horizontal
- Vertical



Horizontal dryer

Horizontal dryer is better than the vertical because less stretch is imparted to the knitted fabrics.

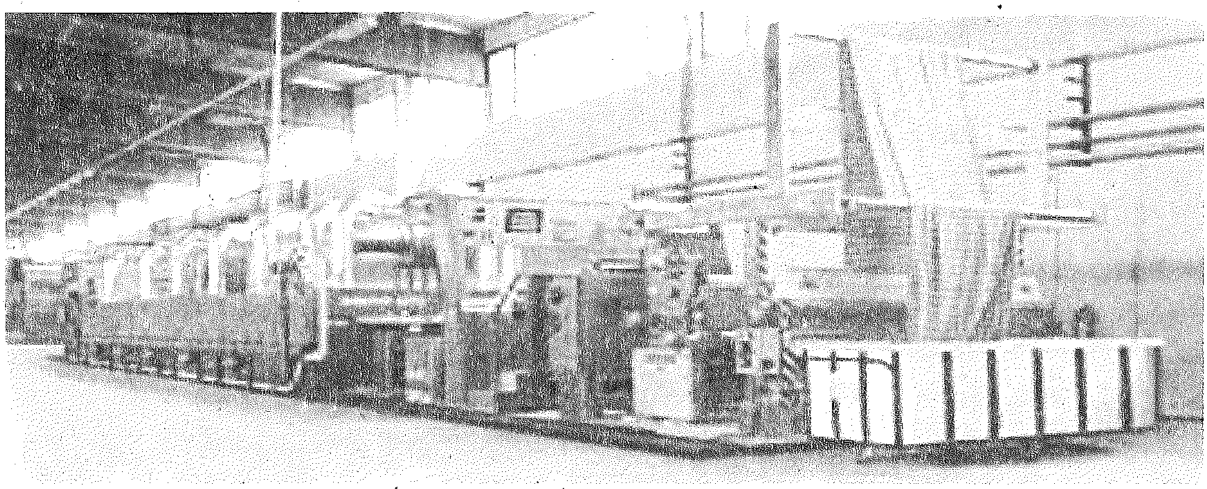
4.3.3.3 Specifications of Machine

- Rated dryer speed=0-20m/m
- Down time=1/2-1hr
- Normal speed=up to 15m/m
- Production=4000kg (max)/day
- Vertical dry

4.3.3.4 Specifications of Machine

- Rated dryer speed=2-20m/m
- Normal speed=up to 15m/m.
- Down time=1/2-1hr
- Production=1000-2000kg/day (depending upon the number of perforated cylinders)

Stenter For Knitted Fabric



4.3.4 Calendar

4.2.4.1 Objective

It is used to control width of the fabrics and to control its shrinkage by giving over feed to the fabrics.

4.3.4.1 Specifications of Machine

- Rated speed=5-30m/m
- Normal speed=up to 20m/m
- Down time=1hr/day
- Production=600-1000kg

4.3.5 Compator

4.3.5.1 Objectve

It is used for the same purpose as calender but gives better results than the calender.

4.3.5.2 Specifications of Machine

- Rated speed=0-40m/m
- Normal speed=up to30m/m
- Down time=1-2hrs
- Production=600-1500kg(depends upon the speed of machine)

4.3.6 Tumbler

4.3.6.1 Objective

A tumbler is used for the drying of fabrics and during this process; shrinkage of fabrics is controlled.

4.3.6.2 Description

Tumbler is a machine that has rotating perforated cylinder .Hot air or steam is passed through the perforated cylinder that causes drying of fabrics along with control of shrinkage.

4.3.6.3. Specifications of Machine

- Temperature for drying=100-120 centigrade (drying with hot air)
- Time for drying=35 min (depending upon the quality of fabric)
- Temperature for drying=100-160(drying with steam)
- Time=45min-1hr (depending upon the quality of fabric)

4.3.7 Raising Machine

This machine is similar as raising machines for woven fabrics. The machine has same card wire roller .The fabric is passed over this roller to give it hairy appearance.

4.3.A Overall Average Wastage in Processing

- White Fabric 2-5%
  (it does not mean bleaching as no wastage occurs in bleaching)
- Dyed Fabric 3-8%
- Printed Fabric 5-10%

Note There are no significant invisible losses during wet processing of fabric process-wise extent of wastage is given in the following table. However, irrespective of individual wastage, the overall wastage in respect of finished fabric will remain as above.

Table 4.1

Process-wise Production And Wastages in Woven Textile Processing

Sr. No.	Name of machine	Rated Daily Production (meters)	Actual Daily Production (meters)	Performance* %age	Chemical Losses* %age	Material losses* %age	Energy Losses* %age
1	Singeing-cum-desizing m/c **(B)**	140,000—175,000	100,000—130,000	75	3—5	Nil	5—15
2	j-box, L-box **(B)**	140,000—175,000	80,000—125,000	45—75	2—3	Nil	3-5
3	Mercerizing m/c **(B)**	85,000—120,000	60,000—80,000	50—70	1—2	Nil	2—3
4	Jigger m/c **(D)**	6,000---10,000	4,000-6,000	65—70	25—30	1—2	2—3
5	Pad thermosol **(D)**	85,000—115,000	25,000—72,000	25—65	5—10	3—5	20—25
6	Pad steam **(D)**	115,000—140,000	40,000—60,000	30—50	3—7	2—3	10—20
7	washing range **(B,D,P)**	175,000—200,000	100,000—145,000	60—75	1—2	Nil	10—15
8	Rotary screen printing **(P)**	85,000—115,000	25,000—80,000	25—65	2—5	2—3	10—20
9	Curing m/c **(P)**	85,000—115,000	45,000—80,000	40—70	Nil	Nil	5—10
10	Ager m/c **(P)**	30,000--40,000	20,000—25,000	50—60	Nil	Nil	2—5
11	Stenter m/c **(F)**	120,000—150,000	80,000—100,000	55—70	2—4	3—5	15—20
12	Calender m/c **(F)**	100,000—115,000	40,000—60,000	35—55	Nil	Nil	2—4
13	Emerising m/c **(F)**	40,000—50,000	18,000—25,000	45—50	Nil	Nil	2—3

14	Sanforising m/c **(F)**	85,000—115,000	35,000—45,000	45—55	Nil	3—5	2—5

(B)–Bleaching, (D)- Dyeing, (P)- Printing, (F)- Finishing.
Material wastage mentioned in column No. 7 is in the form of rags and its value is Rs-10-20 per Kg.

Note: Sanforising process is not applicable on home textiles and curtain cloth etc. It is optional in garment and is usually used for bottoming in trousers etc.

4.3.(B) Consumption of Electricity in Processing

It is not common practice in Pakistan to measure consumption of electricity on machines separately. So it is not practically possible to measure it. On the basis of electricity load on different machines total consumption **(0.33 – 0.4 kwh per meter averagely)** may be broken for machines as under that may be helpful to get an idea to calculate cost of electricity for a specific process.

Table4.2

Serial no.	Name of machine	Consumption of electricity (KWH / meter of fabric)
1	Singeing cum desizing	0.01—0.012
2	j-box or L-box (scouring)	0.04 – 0.05
3	j-box or L-box (bleaching)	0.04 – 0.05
4	Kier (scouring or bleaching)	0.01 – 0.015
5	Mercerizing machine	0.033 – 0.04
6	Washing machine	0.033 – 0.04
7	Pad-thermosol (dyeing)	0.04 – 0.05
8	Pad-steam (dyeing)	0.04 – 0.05
9	Rotary screen printing machine	0.033 – 0.04
10	Curing machine	0.016 – 0.018
11	Ager machine	0.016 – 0.018
12	Stenter machine	0.026 – 0.035
13	Calender machine	0.026 – 0.035
14	Emerising machine	0.013 – 0.015
15	Raising machine	0.02 – 0.025
16	Folding machine	0.003 – 0.005

4.4 Normal Range of Chemical Cost in Processing

Chemical cost for different processes depends upon quality and quality of chemical used, weight per square meter of fabric, machine used for process and results required.

4.4.1 Singeing

No chemical applied.

4.4.2 Desizing

Normal range of costs:

0.1—0.25 Rs per sq. meter

4.4.3 Scouring

Chemical cost of process varies due to following

Normal range of costs:

0.2—0.4 Rs per sq. meter

4.4.4 Bleaching

Normal range of costs:

0.2—0.3 Rs per sq. meter

4.4.5 Solomatic

Normal range of costs:

0.35—0.5 Rs per sq. meter

4.4.6 Mercerizing

Normal range of costs:

0.3—0.5 Rs per sq. meter

4.4.7 Dyeing

Cost of chemicals and dyes used for the process is highly variable due to following factors.

- Dyes (class of dyestuff) used i.e., direct, reactive, sulphur, vat etc.
- Nature of fabric dyed i.e., cotton, polyester etc
- Depth of shade
- Color or tone of shade
- Machine used
- Fastness properties required
- Lot size of fabric
- Weight per square meter of fabric
- Normally in Pakistan cotton and polyester/cotton blend is dyed. For cotton reactive, direct, vat and sulphur dyes are used and for polyester disperse dye are used.

- Normal range of costs:
- Reactive dyes & reactive + disperse dyes

Light or pastel shades	0.05—1.50	Rs per sq. meter
Medium shades	1.50—3.0	Rs per sq. meter
Dark shades	3.5—10.0	Rs per sq. meter

- Vat dyes

Light or pastel shades	2.0—5.0	Rs per sq. meter
Medium shades	5.0—10.0	Rs per sq. meter
Dark shades	10.0—25.0	Rs per sq. meter

- Sulphur dyes

Dark shades black	2.0—2.5	Rs per sq. meter

4.4.8 Printing

Normally in Pakistan cotton and p/c blended fabric is printed with reactive dyes and pigments on rotary screen-printing machine. Cost of chemicals and dyes used for the process is highly variable due to following factors.

- Cover area of printed design
- No of colors in the printed pattern
- Tone of colors
- Depth of colors
- Quality of dyes used
- Quality and quantity of other chemicals used
- Lot size of fabric
- Normal range of costs:

  Pigment printing

50% cover area	2.0—2.5 Rs per sq. meter
100% cover area	3.0—5.0 Rs per sq. meter
200% cover area	6.0—7.0 Rs per sq. meter

- reactive printing

50% cover area	4.0—5.0 Rs per sq. meter
100% cover area	6.0—8.0 Rs per sq. meter
200% cover area	10.0—12.0 Rs per sq. meter

4.5 Finishing

Normally in Pakistan soft finish is applied on the fabric. Cost of chemicals and dyes used for the process is highly variable due to following factors.

- Type of finish (i.e., soft, resin, water repellant, fire retardant etc.)
- Quality of chemicals used
- Weight per square meter of fabric
- Lot size

- Normal range of costs:

- Soft finish	0.1—0.25 Rs per sq. meter
-Garments finish	1.50—1.90 Rs per sq. meter
-Resin finish	1.25—1.90 Rs per sq. meter
-Water repellant finish	5.0—7.0 Rs per sq. meter

Table 4.3

Amount of Chemicals Consumed Per 100 Grams of Fabric During Processing

Process	**Chemicals**	**Consumption in grams per 100 grams of fabric**
Acid desizing	Sulphuric acid or hydrochloric acid	2 – 4
Enzyme desizing	Enzyme	0.4 – 1.0
	Common salt (sodium chloride)	0.04 – 0.05
	Wetting agent	0.16 – 0.72
Scouring	Sodium hydroxide	3.6 – 4.0
	Soda ash or sodium carbonate	0.24 – 0.4
	Wetting agent	0.32 – 0.6
	Sequestering agent	0.16 – 0.32
Bleaching	Hydrogen peroxide	0.8 – 3.0
	Sodium hydroxide	0.16 – 0.2
	Wetting agent	0.08 – 0.24
	Stabilizer	0.28 – 0.8
	Sequestering agent	0.1 – 0.2
Solomatic (combined scouring and bleaching)	Hydrogen peroxide	2.4 – 3.0
	Sodium hydroxide	0.64 – 1.0
	Wetting agent	0.05 – 0.16
	Stabilizer	0.1 – 0.15
	Sequestering agent	0.8 – 1.0
Cold pad bleaching	Hydrogen peroxide	2.8 – 3.0
	Sodium hydroxide	3.0 – 3.5

	Wetting agent	0.65 – 0.7
	Stabilizer	0.6 – 0.65
	Sequestering agent	0.16 – 0.32
	Sodium silicate	0.65 – 0.7
Mercerizing	Sodium hydroxide	20 – 22
Dyeing		
Direct dyes for cotton on jigger machine or soft flow	Dyes	Up to 10 – 12
	Common salt	10 – 15
	Soda ash	2.0 – 5.0
Reactive dyes for cotton on jigger or soft flow machine	Dyes	Up to 12
	Soda ash	6.0 – 8.0
	Common salt	15 – 20
Reactive dyes for cotton on pad-thermosol	Dye	Up to 8
	Soda ash or sodium bicarbonate	1.0 – 2.5
	Urea	5.00 – 10.0
	Sodium alginate	0.20 – 0.35
Reactive dyes for cotton on pad-steam	Dyes	Up to 8
	Soda ash or sodium bicarbonate	0.7 – 1.5
	Urea	1.5 – 2.0
	Resist salt	0.3 – 0.4
Disperse dyes for polyester on jigger	Dye	Up to 8

	Acetic acid	0.4 – 0.5
	Dispersing agent	0.5 – 0.6
	Carrier (optional)	1.0 – 2.0
Disperse dyes for polyester on pad thermosol	Dye	Up to 6
	Acetic acid	0.07 –0.1
	Dispersing agent	0.15 – 0.2
	Alginate	0.3 – 0.35
Vat dyes for cotton on jigger or soft flow	Dye	Up to 5
	Common salt	4.0 – 6.0
	Sodium dithionate	4.0 – 6.0
	Sodium hydroxide	6.0 – 9.0
	Hydrogen peroxide or potassium dichromate	2.0 – 4.0
Vat dyes for cotton on pad-thermosol	Dye	Up to 5
	Sodium alginate	0.35 – 0.5
	Sodium dithionate	2.0 –3.0
	Sodium hydroxide	3.0 – 4.0
	Hydrogen peroxide or potassium dichromate	0.3 – 0.5
Sulphur dyes for cotton on pad steam	Dyes	Up to 7
	Sodium sulphide	Up to 10 (depends upon amount of dye)
	Potassium dichromate or hydrogen peroxide	0.3 – 0.5
	Acetic acid	0.5 – 0.7

Finishing on stenter machine	A large variety of chemicals is used with different combinations and propotions. So we take amount of all chemicals.	16 – 40
Printing (for 100% coverage taken as standard)	Printing paste	Amount of chemicals in grams per square meter of fabric)
	Pigment printing paste containg pigments, thickeners and binders	85 – 90
	Reactive printing paste containing reactive dye, sodium alginate and alkali	90 – 95

4.6 Dyes and their uses

Dyes are specific in nature and certain types of dyes are applicable on certain types of fabrics. One dye can be used for dyeing more than different types of fibers and vice versa. Most common practice is as under: Moreover, the range of current market prices is also indicated for information purposes:

Price-Range/Kg (June 2002)

For cotton

- Direct dyes — Rs. 200-1200
- Reactive dyes — Rs. 200-2500
- Sulphur dyes — Rs. 100-500
- Vat dyes — Rs. 400-3000

For polyester

- Disperse dyes Rs. 300-1000

For wool

- Acid dyes Rs. 300-500
- Reactive dyes

For acrylic

- Cationic dyes Rs. 200-500

For nylons

- Acid dyes
- Cationic dyes

4.7 Varying Amounts of Chemicals For Same Process

The most common variables in processing are type and quantity of chemicals, temperature and time of processing. Each unit has its own recipes and amounts of chemicals used for the same process per unit weight of fabric vary from mill to mill. Following are some common reasons for this variation.

- Same results can be achieved by using smaller amount of chemicals with longer treatment times and lager amounts of chemicals with shorter treatment times.
- Same results can be achieved by using smaller amounts of chemicals at higher temperature and larger amounts of chemicals at lower temperature.
- Light qualities (by weight) require lesser amounts of chemicals and milder conditions as compared to denser and heavy qualities. These varieties need severe conditions and larger quantities of chemicals.
- Requirement of results and hence amounts of chemicals of each process vary from lot to lot e.g. how much absorbency is required during scouring or how

much whiteness is required in bleaching.

As a conclusion, quantity of chemicals consumed for each process is based upon the following factors.

- Treatment time
- Treatment temperature
- Requirement of results
- Construction of fabric

4.8 Changes in Fabric During Processing

Fabric quality is generally described for its warp count, weft count, number of warp yarns (ends) per inch, number of weft yarns (picks) per inch and width of the fabric. During wet processing certain changes may take place as under:

4.8.1 Change in the count of warp yarn

The count of warp yarn becomes finer 3 – 5 % due to following reasons

- Different impurities inherently present in cotton are removed during wet processing and it improves the fineness of yarn.
- Continuous warp-wise stretch on fabric during wet processing elongates and makes warp yarns thin. Ultimately the count becomes finer.

4.8.2 Change in the count of weft yarn

The count of weft yarn becomes finer 1.5 – 3.0 % due to removal of impurities from the yarn.

4.8.3 Change in length and width of fabric

During the whole wet processing there is a continuous warp-wise stretch on the fabric due to which fabric is elongated warp-wise and reduced weft-wise hence its length is increased and width is decreased. (this increase in length is generally termed as gain in fabric length).

Gain is more in case of plain weaves and light weight fabrics as compared to denser qualities like twill. Normally fabric with plain weave gets a gain of 2 – 3 %. Finished width of fabric is always less than its grey width by 6 – 8 %.

4.8.4 Change in ends and picks per inch of fabric

As a result of above three fiber behavior modifications, normally an increase in warp yarns per inch (ends) and a decrease in weft yarns per inch (picks) are observed.

4.9 Normal Value Addition in Processing

Value addition of woven fabric during Processing based at 100" wide fabric (Values in rupees/Meter).				
	Bleaching	**Dyeing**	**Printing**	**Total**
o Commodity Items	3-5	3-5	3-10	6-15
• Moderate Items	10-15	15-20	10-15	25-35
▪ Valued/Fashion Items	10-20	20-30	15-20	35-50

- **Commodity Items**

Commodity items mean plain and light weight qualities that are generally processed in market e.g., 76*52*, 76*56, 76*68 etc

- **Moderate Items**

Moderate items are those, which fall in between commodity and fashion items and require relatively complex processing e.g., satins, twills etc.

- **Valued/Fashion Items**

Fashion items are those, which require much complex processing e.g., Denim, Jacquard and dobby products.

4.10 Issues Relating to Sales Tax

4.10.1 For Sales Tax purposes the processing sector is like a bridge which is to be crossed by about all woven and knitted grey fabric. If all such fabric is accounted for and documented at this bridge, a number of tax related problems like under reporting of production by the registered processors, non-reporting of taxable activity by the vendors/ wholesalers/investors and non-payment of tax on local sale etc could be taken care of. But unfortunately a substantial portion of processed cloth, particularly relating to local market remains undeclared/undocumented.

4.10.2 A large number of processing units claim to be working as vendors and pay Sales Tax on conversion charges only. There exists a strong apprehension that certain processing units might be processing their own grey cloth actually owned by them or by their sister firms purchased from unregistered persons and by paying tax on conversion charges only, tax chargeable on grey cloth might be evaded. In fact the invoice to be issued under the law should contain complete name and address of the buyer. But incomplete address of such owner of grey cloth is deliberately given by the processor so that the department could not reach out to him for registration and tax payment. As such the implementation of tax needs to be ensured with the help of their Association.

4.10.3 There is no practice of disclosing the name and address of unregistered owners of grey cloth which is processed on conversion charges basis. As such the department cannot reach to such persons for registration and tax payment.

4.10.4 Excessive input tax adjustment is claimed on the basis of flying invoices of expensive dyes and chemicals which are actually not used or used in minor quantities.

4.11 Audit Guidelines

4.11.1 Is the reported production/supply compatible with the economic viability of the unit and consumption of energy. Para 4.3.(B) can be used as reference.

4.11.2 Are the dyes and chemicals claimed to have been used in the processing, are actually useable on the type of fabric produced (e.g. only disperse dye is used for polyester fabric but if reactive or Vat Dye is used, it needs probe). Para 4.6 can be used as a reference.

4.11.3 Stock and, if they exist, production record can be manipulated. Comparison between stock records and actual stock may reveal discrepancy in both.

4.11.4 Are the production record consistent with purchases and sales.

4.11.5 Pigment colours are generally used for dying curtain and quilt cover (Razai) fabric. Compare the supply of this type of fabric with the input invoices of dyes to see any other dye has been used for this purpose.

4.11.6. In order to check undue input tax adjustment, scrutinize the input invoices to see if the chemical / dyes used are in the normal range. In case the invoices are of most costly inputs, see whether the value of dyed/printed fabric is accordingly higher or not.

4.11.7 It will be useful if names and addresses of the persons whose grey cloth has been processed are ascertained so as to reach to them for registration and tax payment. Please refer journal order 1/98 and Section 2(46)(f) of Sales Tax Act, 1990.

PROCESSING

Summary of Important Information

1. **Overall Average Wastage in Processing**

• White Fabric (it does not mean bleaching as no wastage occurs in bleaching)	2-5%
• Dyed Fabric	3-8%
• Printed Fabric	5-10%

2. **Normal Range of Chemical Cost in Processing**

Process	Cost range per Sq. meter	
Desizing	Rs. 0.10—0.25	
Scouring	Rs. 0.20—0.40	
Bleaching	Rs. 0.20—0.30	
Solomatic	Rs. 0.35—0.50	
Mercerizing	Rs. 0.30—0.50	
Dyeing	• <u>Reactive dyes & reactive + disperse dyes</u>	
	Light or pastel shades	Rs. 0.05—1.50
	Medium shades	Rs. 1.5 --- 3.0
	Dark shades	Rs. 3.5 ---10.0
	• <u>Vat dyes</u>	
	Light or pastel to dark shades	Rs. 2.00—5.00
	Medium shades	Rs. 5.00—10.00
	Dark shades	Rs. 10.00—25.00
	• <u>Sulphur dyes</u>	
	Dark shades black	Rs. 2.0—2.5
Printing	• <u>Pigment printing</u>	
	50% covered area	Rs. 2.0—2.5
	100% covered area	Rs. 3.0—5.0
	200% covered area	Rs. 6.0—7.0
	• <u>reactive printing</u>	
	50% covered area	Rs. 4.0—5.00
	100% covered area	Rs. 6.0---8.0
	200% covered area	Rs. 10.00—12.00
Finishing	- Soft finish	Rs. 0.10—0.25
	-Garments finish	Rs. 1.50—1.90
	-Resin finish	Rs. 1.25—1.90
	-Water repellant finish	Rs. 5.0—7.0

irect dyes Reactive dyes Sulphur dyes Vat dyes	Disperse dyes	Acid dyes Reactive dyes	Cationic dyes	Acid dyes Cationic dyes

3. Dyes and their Usage

For Cotton	For Polyester	For wool	For Acrylic	For Nylon
Direct dyes Reactive dyes Sulphur dyes Vat dyes	Disperse dyes	Acid dyes Reactive dyes	Cationic dyes	Acid dyes Cationic dyes

4. Change in the count of yarn

The count of warp yarn becomes finer 3 – 5 % in processing

5. Change in length and width of fabric in processing

Length is increased and width is decreased.

Normally fabric with plain weave gets a gain of 2 – 3 %. Finished width of fabric is always less than its grey width by 6 – 8 %.

Also ends increase, picks decrease

6. Normal Value Addition in Processing

Fabric width 100" (Rupees/Meter)				
	Bleaching	**Dyeing**	**Printing**	**Total**
• Commodity Items (light weight etc)	3-5	3-5	3-10	6-15
• Moderate Items (Twil etc)	10-15	15-20	10-15	25-35
• Valued/Fashion Items (Jacquard)	10-20	20-30	15-20	35-50

Chapter 5

KNITTING & STITCHING

List of Paragraphs

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Chapter 5

KNITTING & STITCHING

5.1 Introduction

Knitting and weaving are two different methods of developing fabric. In weaving, the lengthwise yarn, which runs from the back to the front of the loom, form the basic structure of the fabric and is called the warp. The crosswise yarn is the filling , also referred to as weft. Woven fabric cannot stretch to any marked degree unless it is specially stretch woven. Knitting is a textile process in which yarn is converted in to fabric by passing loops of yarns through on another. As against woven fabric which is measured by length, the knitted fabric is generally measured by weight. The properties of knitted fabric, which is generally made from combed yarn, are completely different from that of woven fabric and has the following characteristics.

- The interlocking loops of the knitted construction permit the fabric to stretch in any direction.
- Knitted fabric also gives warmth because of the insulate air pockets contained in this type of construction.
- knitted fabric is very absorbent, light in weight and wrinkle resistant.

5.1.1 Construction of Knitted Fabric

Thread count (the number of threads per square inch, or cm) is used to evaluate the construction of woven fabric. The construction of knitted fabrics is evaluated by the number of stitches or loops. When the interlocking loops run lengthwise, each row is called a wale. A wale corresponds to the direction of the warp in woven fabrics. When the loops run across the fabric, each row is called a course. A course corresponds to the filling, or weft. Thus, a knitted fabric having 40 loops or stitches in 1 inch of width, and 50 loops in 1 inch of length, is said to have 40 wales and 50 courses. In metric terms, a knitted fabric having 16/cm loops or stitches across the width and 20/cm loops in the length is said to have 16 wales and 20 courses.

5.2 Types of Knitting

There are two main types of knitted fabrics

- Those produced by weft knitting

Where one continuous yarn forms courses across the fabric

- Those produced by warp knitting

Where a series of yarn forms sales in the lengthwise direction of the fabric.

5.2.1 Weft Knitting

This is most common type of knitting. Fabric produced on weft knitting machines is used entirely for making garments.

There are three fundamental stitches in weft knitting.

5.2.1.1 Plain-knit stitch – The plain knit is the basic form of knitting. It can be produced in flat knit or in tubular (or circular) form. The flat knit is also called jersey stitch because the construction is like that of the turtleneck sweaters.

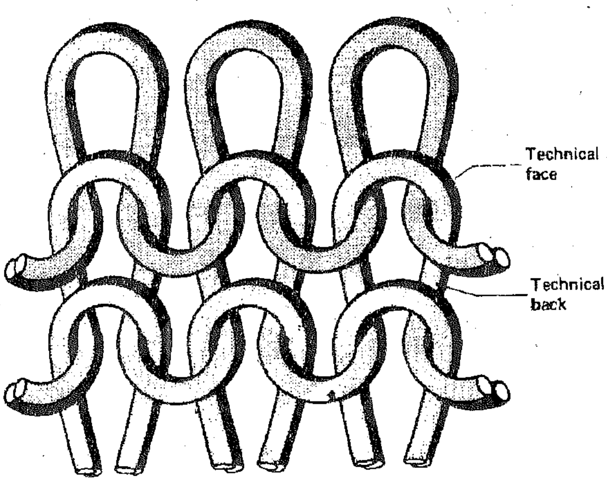
5.2.1.2 Purl stitch -- it is made on flat-bed and circular machines by needles using hooks on both ends to alternately draw loops to the front of the fabric in one course and to the back in the next course. It is slower or more costly technique. The fabric looks the same on both sides.

5.2.1.3 Rib stitch – Rib-knit fabrics have alternating length wise rows of plain and purl stitches construction so that the face and back of the fabric appear alike. It is a costlier technique.

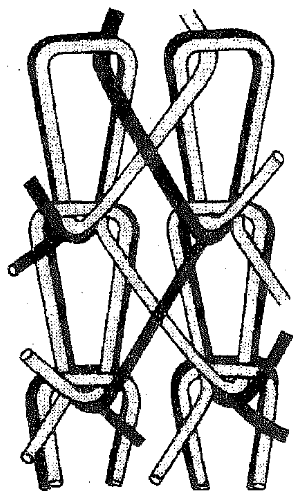
5.2.2 Warp Knitting

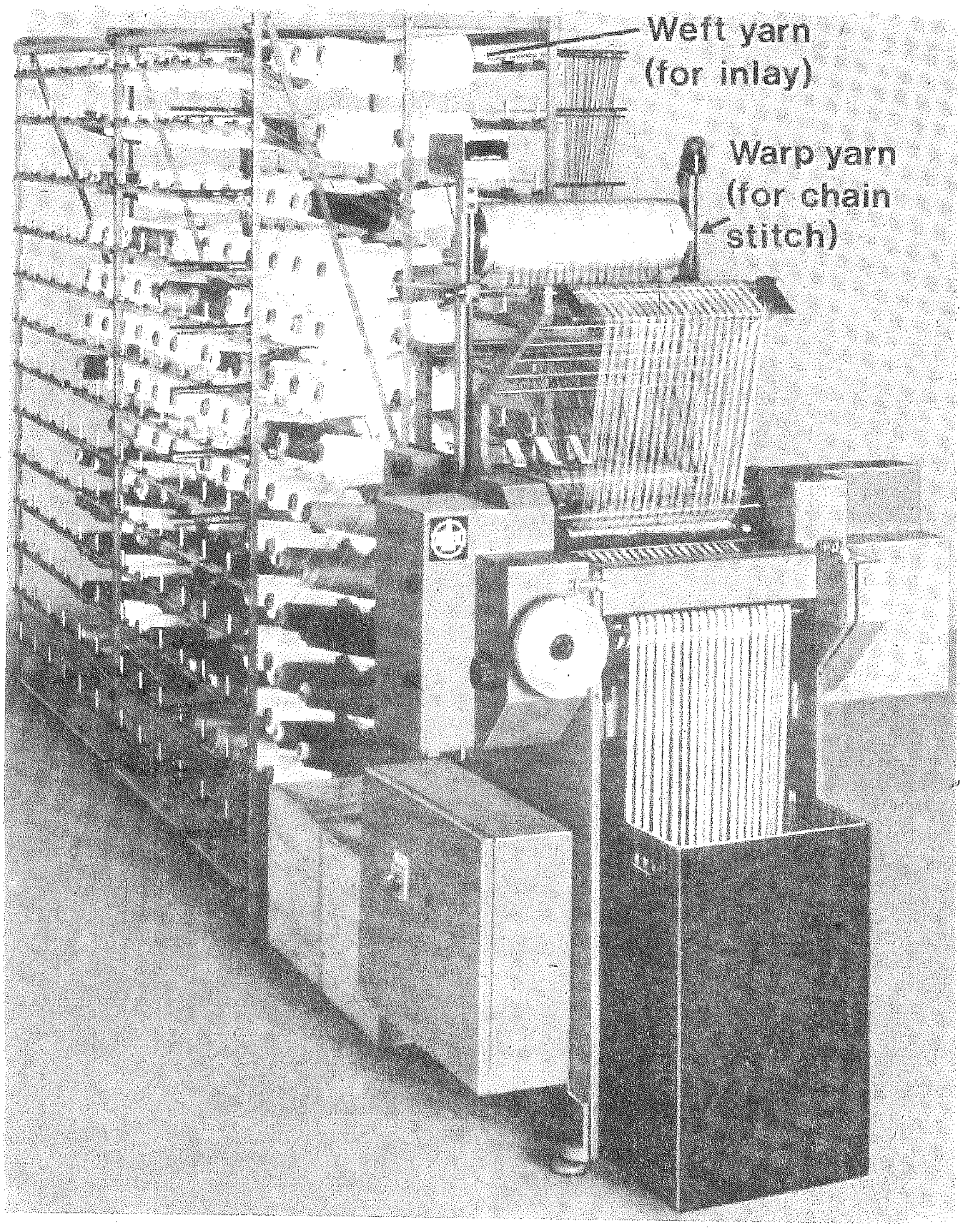
Warp knitting differs from weft knitting ' basically, in that each needle loops its own thread. The needles produce parallel rows of loops simultaneously that the interlocked in a zigzag pattern. The stitches on the face of the fabric appear vertically, but at a slight angle and the stitches on the back appear horizontally as floats at a slight angle.

Weft knitted Loops

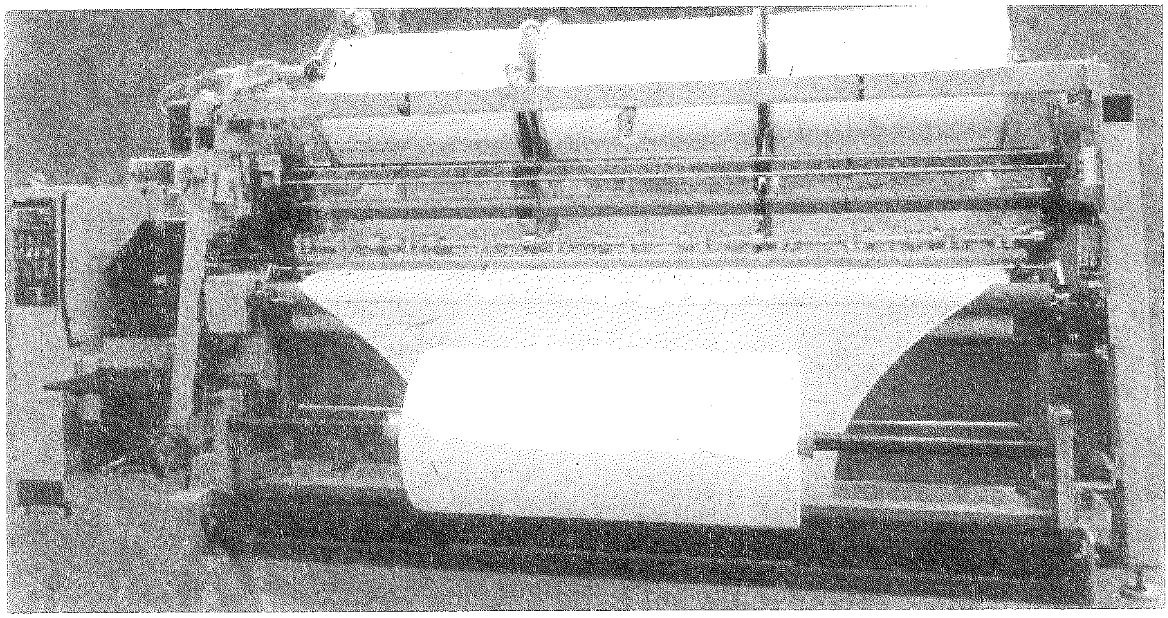


Warp knitted loops





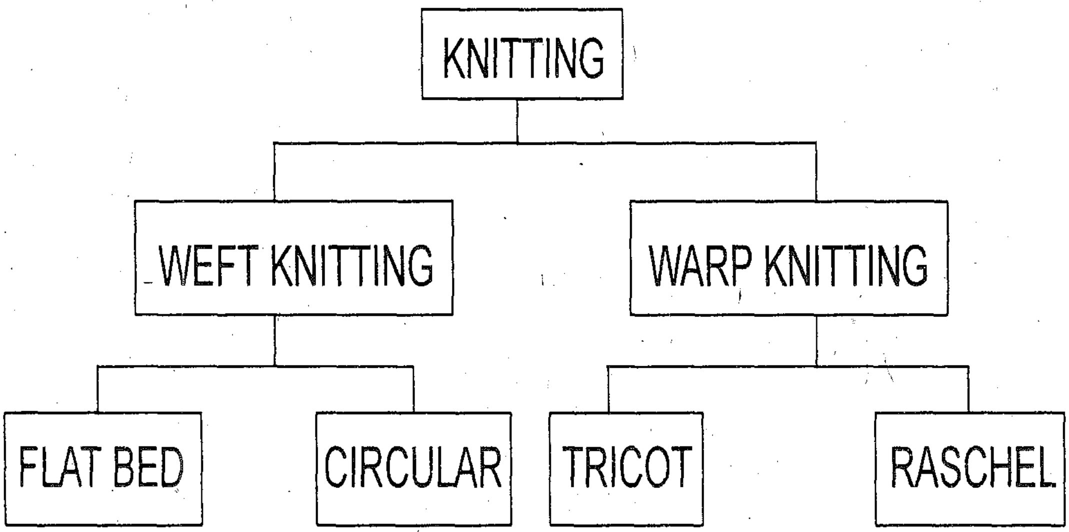
Crochet Machine



Warp Knitting

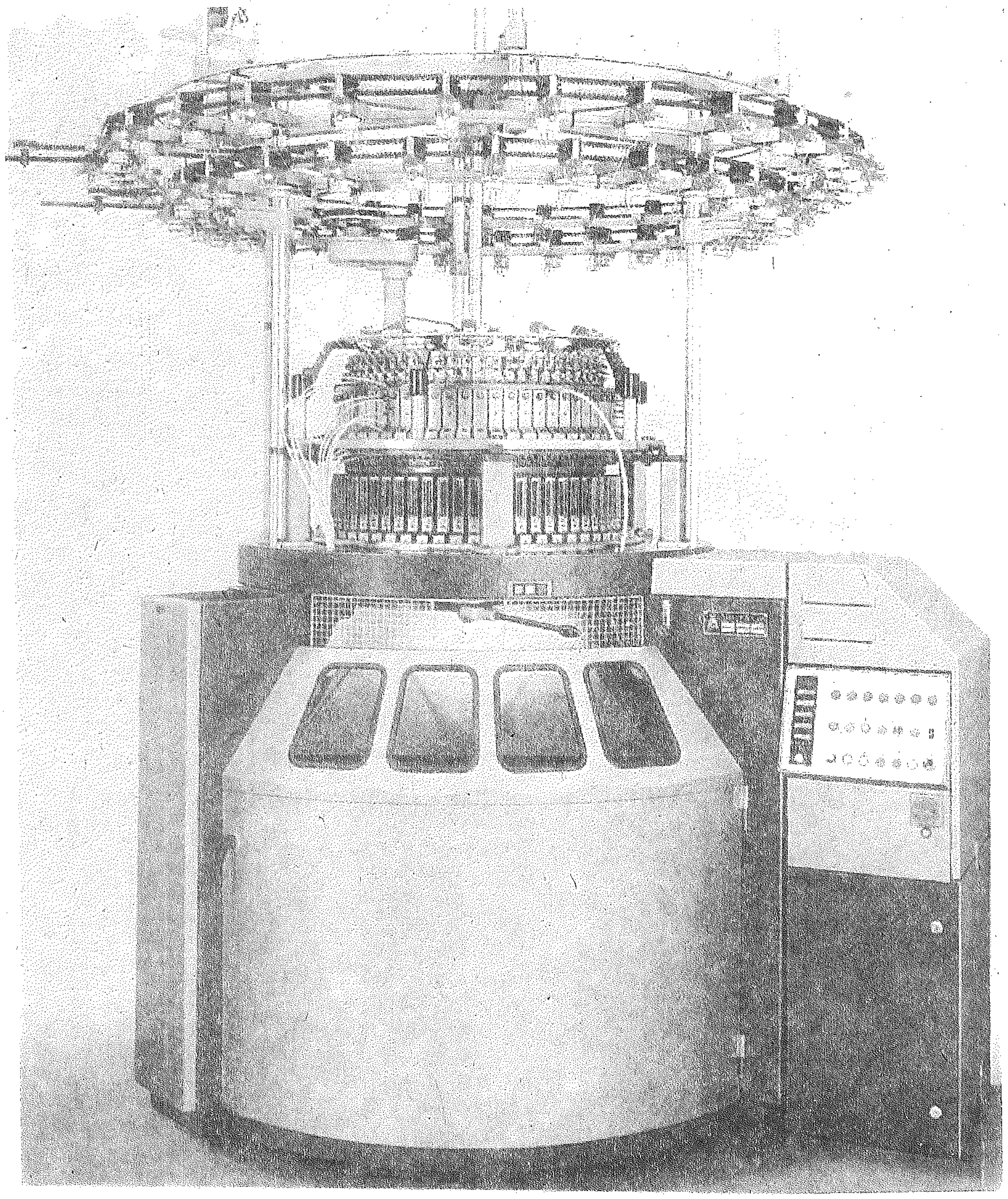
5.3 Types Of Machines In The Knitting Dept

- Circular Knitting Machines
- Flat Knitting Machines

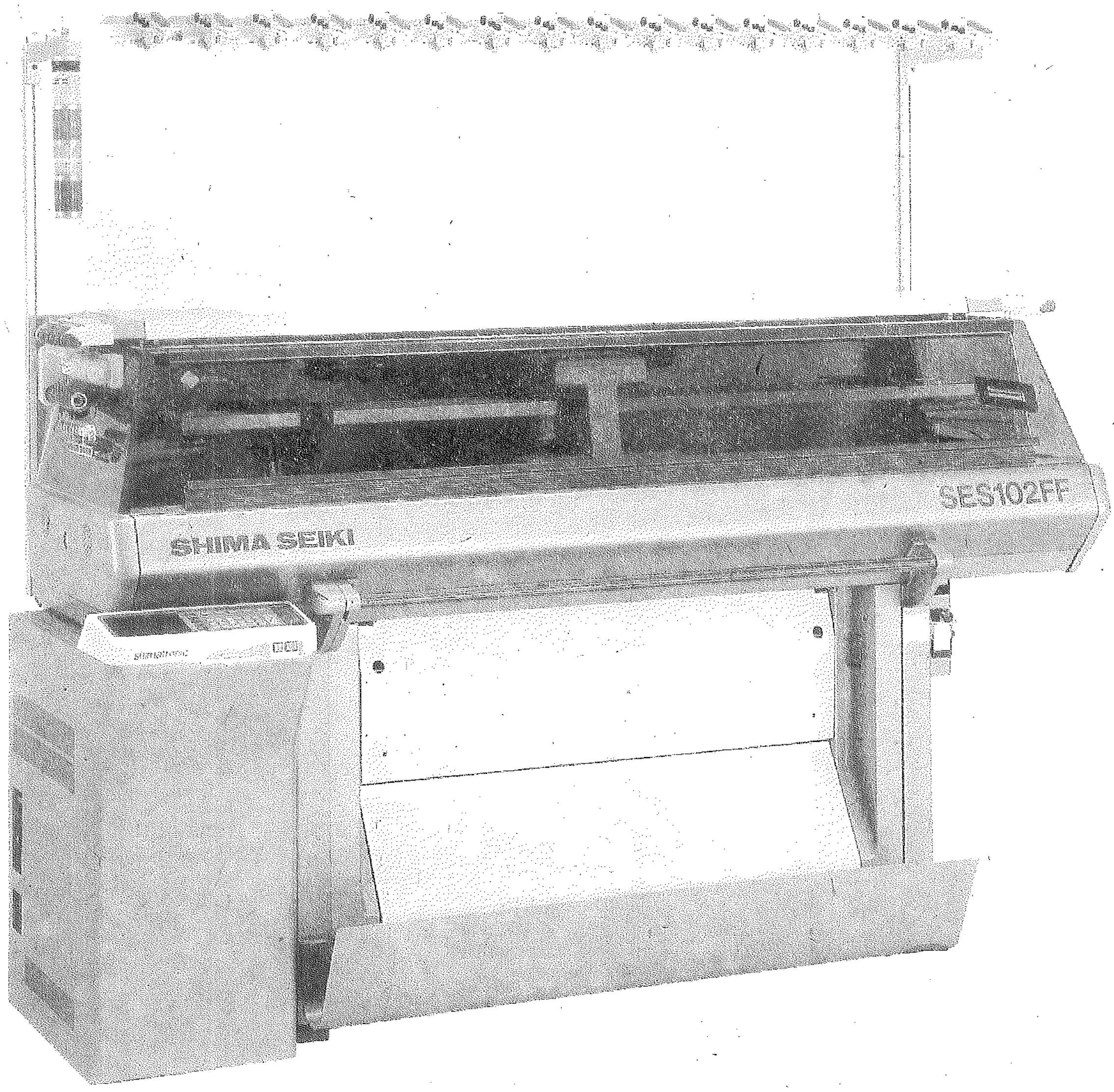


5.3.1 Types of Circular Kniting Machine

- Double Knit Simple and Jacquard.
- Single Jersy and Single Knit Machines
- Fleece knitting
- Sharps
- Interlock



Circular Knitting Machine



Flat Knitting

5.3.2 Single Jersey Machine

These machines are also known as single knit or Plain Knit machines. Only one set of needles is used in these machines. Sinkers are used in conjunction with the needle. These are multi-feeder high production machines. Fabric is made in tubular form, which can be cut later on to give a flat fabric. Machines are available in different diameters and configurations.

5.3.2.1 Types of Machine

- Single track
- Multi-track, 4-track
- Striper
- Pattern Wheel or mini Jacquard
- Fully electronic Jacquard

5.3.2.2 Operating Particulars

Machine dia	24 inch	26 inch	30inch	34inch
Gauge	20,24,28	20,24,28	20,24,28	20,24,28
RPM	20-25	20-22	18-20	18-20
Production Kg/24hrs	250 kg	300 kg	400 kg	500kg
Motor rating		5-6 KW		

5.3.3 Fleece knitting Machine

These are single jersey circular knitting machine used for producing fleece fabric. Fleece fabric is used for sports wear such as jogging suits.

5.3.3.1 Types of Machine

- Two thread fleece
- Three tread fleece

5.3.3.2 Operating Particulars

Machine dia	26 inch	30inch	34inch
Gauge	18-20	18-20	18-20
RPM	20-22	18-20	18-20
Production Kg/24hrs	350kg	450 kg	550kg
Motor rating 5-6 KW			

5.3.4 Double Knit Machine

These machines are also known as Rib Machines. These machines have two sets of needles- one in the dial and the other in the cylinder. Sinkers are not used. The fabric is produced in a form of tube, which is used to produce body size garments. Tubular fabric can be cut to produce open width fabric.

5.3.4.1 Type of Machine

The following types of rib machines are available in industry

- Single track
- Multi-track
- RTR- garment length machine
- Jacquard Machine

5.3.4.2 Operating Particulars (large diameter)

Machine Dia.	14"	16"	18"	20"	22"	24"	26"	30"
Feeders	28	32	36	40	44	48	52	60
RPM	74	66	58	52	48	44	40	35
Motor rating	5-6 KW							

5.3.4.3 Operating Particulars (Small diameter)

Machine Dia.	7"	8"	9"	10"	11"	12"	13"
Feeders	10	12	14	16	20	22	26
RPM	110	96	90	85	80	77	75
Motor rating	3-4KW						

5.3.5 Interlock Machine

These are also double knit machines, in sense that two sets of needle are used. Some of these machines are interchangeable to rib machine while others are purely interlock machines. Interlock fabric is produced on these machines.

5.3.5.1 Operating Particulars

The operating particulars of these machines can be considered almost same as rib machines.

5.3.6 Terry Machine

These are single jersey machine with special features to produce towel like or terry fabric. This is a specialty machine. Comparatively very few machines are being used in industry.

5.3.6.1 Operating Particulars

Machine Diameter	30"	34"
Gauge	16,18,20,26	16,18,20,26
RPM	18-20	16-18
Production/day	200-250Kg	250-300Kg

5.3.7 Flat Knitting Machine

This machine is used to produce collars or sleeves. There is no cylinder involved and it is in flat shape.

Few Types of Flat Knitting Machines

Table 5.1

SR. NO.	MADE	DESCRIPTION	GG	BED	DAILY
1.	MITSHIA	POWER MACH COL/BAND	14E	40"	400P/MACH
2.	KU626-JAQUARD	FULLY AUTOMATIC DESIGN	14E	52"	400P/MACH
3.	MCI	POWER MACH COL/BAND	12E	68"	300P/MACH

5.4 Commonly Produced Fabrics

Table 5.2

Fabric Type	Yarn Type	Lycra	Yarn Count	GSM Grams/Sqm
Plain	100% cotton, P/C & C/P	20 to 70 denier	12/1 – 40/1	90-280
Pique, single, double, Lacoste	100% cotton, P/C & C/P		16/1-40/1	140-350
Double knit, Rib	100% cotton, P/C & C/P		16/1-40/1	140-450
Interlock	100% cotton, P/C & C/P		24/1-40/1	180-350
Fleece	100% cotton, P/C & C/P		20/1-40/1 Face 6/1-16/1 Loop	240 -500
Terry	100% cotton, P/C & C/P		10/1-40/1	150-350
Honeycomb	100% cotton, P/C & C/P		16/1-40/1	140-350

5.5 Consumption Formula For Electricity And Gas

Table 5.3

Consumption of electricity and gas for wet processing of knitted fabric per Kilogram of fabric is as under.

Consumption of	Units	Consumption
1. Electricity	Kilowatt Hour	0.75-0.9813
2. Gas	Mm BTU	0.072-0.084
	Hectameter	0.0214-0.025

5.6. Average Conversion Charges(Not Applicable to composite units)

Table 5.4

S/N	Fabric	Conversion Rs/kg
1	Single Jersey	Rs. 9-10/Kg
2	Rib, Double Knit	Rs. 12-14/Kg
3	Small diarib	Rs. 7/Kg
4	Interlock	Rs. 12-14/Kg
5	Pique, Lycost	Rs. 9-10/Kg
6	Fleece	Rs 11-12/kg
7	Lycra knitting	For Lycra Rs. 5/kg are added to the normal knitting rate

5.7. Production Formula for Knitting

Production calculations for circular weft knitted fabrics is fairly simple and can be calculated as follows;

- For plain and 1x1 Rib fabric

$$\text{Linear Meters/ hour} = \frac{\text{m/c RPM} \times 60 \times \text{Nos. of feeders} \times \text{efficiency\%}}{\text{Courses/cm} \times 100}$$

- For interlock fabric

$$\text{Linear Meters/hour} = \frac{\text{M/c RPM} \times 60 \times 100 \text{ of feeders} \times \text{efficiency\%}}{2 \times \text{courses / cm} \times 100}$$

- $$\text{Kg/hour} = \frac{\text{GSM} \times \text{Sq. m fabric produced/hr}}{1000}$$

5.8 Processing of knitted grey fabric

The knitted grey fabric undergoes the process of bleaching and dying, as discussed in the chapter for processing. Different chemicals are applied on the fabric to remove impurities, alkalies, crease and hardness etc. Then the bleached fabric is dyed as per requirement.

5.9 Material Wastage

Like all other textile processes knitting also involves material wastage. The level of wastage, may vary from one mill to another nevertheless, it is unavoidable. The factors that affect material wastage are as under:

- Quality of yarn
- Count of yarn
- Type of machine
- Type of Fabric
- Age/Condition of machine
- Management controls
- Level of skill

Normal material wastage figure at different stages of knitting is as under:

5.9.1 Average Material Wastages

Yarn has to pass through various processes for the manufacture of knitted garments, as such there are a number of stages where wastages occur. Knitting wastage can be divided into two broad categories i.e. invisible wastage (yarn to fabric stage i.e. knitting, scouring & bleaching, dyeing, brushing/sheering and panal garment washing) and visible wastage (fabric into garment stage i.e. cutting printing, embroidery, overlocking & B quality. Commonly manufactured knitted garments include Basic Tee/Polo, Basic Sweat, Bottoms, Fashion Apparel, Fashion Apparels yarn dyed and solid velour. The percentage in all of these garments varies from one another but since the production/supply/export includes all types of garments, the overall average ratio of wastage in knitted garments is as under:

Table 5.5

Overall Wastage in Knitting

	Description	**Average wastage**
a)	Units not using dyed yarn for their production	35%
b)	Units using both un-dyed and dyed yarn for their production	40%
c)	Units using entirely dyed yarn for their production	45%

Note: These wastages percentages include moisture variation factor, sampling waste and waste of each and every type of manufacturing process employed in the knitting industry but does not include 1-3% garment rejection as B or C grade.

5.9.2. Sale Value of Knitting Waste/Rejection

Although there are no fixed rates, the normal price for different types of waste/rejection is as under:

Table 5.6

▪ Yarn waste	Rs. 5/Kg
▪ Brushing	Rs. 2/Kg
▪ Shearing	Rs. 2/Kg
▪ Cutting	Rs. 4/Kg
▪ Over lock	Rs. 0.62/Kg
▪ Embroidery	Rs. 5/Kg
▪ Garments (Men's)	35-40% of the A-grade price when sold in the local market
▪ (Women's)	15-20% of the A grade price when sold in the local market

5.9.3 Wastage in Woven Garments

Average wastage in garments manufacturing from woven fabric is as under:-

Table 5.7

▪ Cutting	12-14%
▪ Stitching	1-1.5%
▪ Garment rejection	2-3 %

5.9.4 Wastage for Garments requiring Washing/After-treatment

Certain garments such as denim, require washing and other treatment to render a special look. The garment rejection for such garment is as follows.

Table 5.8

▪ Simple Wash	2-3%	or
▪ Stone Wash	4-5%	or
▪ Sand Blast	6-7%	or
▪ Fashion garment-non-stretchable	5-6%	or
▪ Fashion Garment-stretchable	7-8%	or
▪ Over dyed/dirty look	5-6%	

5.9.5 Material Wastage for Made-ups

Made –ups are segregated into two categories, namely, small and large.The small made-ups includes pillowcases and cushions etc. The large made-ups include bed sheets, quilt covers, fitted sheets, cushions etc. Wastage percentages in made-ups is as under:-

Table 5.9

	A- SMALL
▪ Printed	2-3% or
▪ Bleached-white	4-5% or
▪ Pastel-light colors	4-5%
▪ Dark dyed	2-3%
	B- LARGE
▪ Bleached-white	6-7% or
▪ Light & pastel colors	6-7% or
▪ Printed & dark dyed	4-5%

Note : In case of made-ups the effective or actual wastage is only half of the figures given above, the rest is saleable at half price.

5.10 Socks Knitting

Socks knitting industry is separate sector of knitting industry. In the sense that it produces only socks of different sizes and styles. Machines used for socks knitting are different from other knitting machines. The whole stock is manufactured on circular knitting machine except linking of toe. Linking is done on linking machine.

5.10.1 Operating Particulars

Machine dia	3.5 inch	4.0 inch	Remarks
Gauge	108-120 needles	108-120 needles	
Power	1-2Kw	1-2Kw	Depends of machine type

5.10.2 Production Process

Following operations are involved in socks production

1. Yarn – raw material
2. Knitting
3. Toe Closing
4. Washing,(bleaching, dyeing optional)
5. Drying
6. Boarding & pressing
7. Packing

5.10.3. Production Factors

Production of socks machine is measured in dozen pairs per given time. This depends mainly on the following factors:

- Socks type, sports or dress socks
- True heel or pouch heel
- Size of Socks
- Type of machine
- Type of yarn
- Machine efficiency

5.10.4. Production Capacity

- Dress socks on old machines – 15 -20 dozen per day
- New machines up to 100 dozens per day
- Sports socks average production on new machines 50 dozens/day

5.10.5.Types of Yarn Commonly Used

Mainly cotton, nylon, polyester and woolen yarns are used.
Carded and open end cotton yarn of 10s, 12s, 16s and 20s are generally used for stocks. While for polyester 150 denier is most common and Nylon is 70/2 denier.

5.10.6. Material Wastages in Sock Manufacturing

Table 5.10

• Invisible waste	1-2 %
• Knitting of socks	2-3 %
• Dying of socks upto	3%
• Refection on stiching, pressing etc 4%-5%	

N. B. The maximum material waste is up to 15 %. This includes mainly the production of faulty or damaged socks.

5.11 Stitching

Garment manufacturing is a complex process. A number of operations are carried out in a sequence for manufacturing of apparels. Before the actual production of a garment starts, considerable planning is done by the management.

5.11.1 Sequence of Operations

- Fabric – roll form
- Lay-planning, marker making, grading
- Fabric spreading, laying fabric on cutting table
- Cutting
- Numbering & auditing different garment panels
- Bundling
- Stitching
- In-line quality control
- Checking before press
- Pressing
- Final checking/inspection
- Packing
- Audit quality level-random checking of packed garments
- Dispatch

5.11.2 Machines used for Stitching

- Single Needle – Lock Stitch
- Double needle –Lock Stitch
- 3-thread Overlock machines
- Safety Overlock

- Flat lock
- Feed of the arm or FEEDO machine
- Lappa – Lock Stitch
- Single Needle edge cutter machine
- Bar Tack
- Button Hole machine
- Button Key Hole machine
- Welt machine
- Embroidery machine
- Cutting Knife, circular and straight
- Flat screen Printing machine

5.11.3 Inputs For Stitching

- Fabric
- Rib, Collars, Sleeves, Tippings
- Accessories-buttons, zips, toggles, strings, laces, stoppers, hooks & eyes, buckram, trimmings
- Sewing thread
- Elastics
- Polythene bags
- Cartons
- Plastic barbs
- Tags
- Labels- imported, 10% local
- Butter paper
- Adhesive tape

5.11.4 Commonly Produced Garment Parameters

Table 5.11

S/No.	Garment	Fabric type	Weight
1	T-shirts	Single jersey (S/J), Interlock(I/L)	200 – 300grams
2	Polo T-shirt	S/J, PK	250-350 grams
3	v-neck full sleeve	I/L, Rib, fleece	300-600 grams
4	Round neck(crew neck) full sleeve	I/L, rib, Fleece	300-600 grams
6	Track suit full	Fleece fabric	600-900 grams

5.11.5 Estimated Normal Value Addition In Knitting & Garments

Table 5.12

S/N	Process	Value addition	Amount	Remarks
1	Knitting	Per Kg of yarn	Rs.10-15	Depends on type of fabric-average cost
2	Bleaching	Per Kg of fabric	Rs. 30-60	Average cost
	Dyeing & bleaching	Per Kg of fabric	Rs. 40-90	Average cost
3	Finishing	Per Kg of fabric	Rs. 20-25	Average cost
4	Stitching	Rs. 100/ pre dozen to Rs. 600/per dozen		

5.12 Issues relating to sales tax

5.12.1 Relevant quantity and count of Yarn used

Flying invoices of combed yarn might be shown to have been used in order to claim undue inputs against the use of carded yarn. Similarly undue input may be claimed on yarn of super fine counts which are normally not used in the knitting industry.

5.12.2 Composite unit or incomplete knitting unit.

Input tax adjustments on the input goods of all of the processes is admissible from the output tax if the processes of knitting, bleach/dying and stitching are completed in the composite unit. Sometimes an incomplete composite unit, might claim input adjustment on invoices of missing processes, which actually are not performed in that unit.

5.12.3 Under reporting of production

Under reporting of production as against the actual production capacity, particularly by the units making local supplies is a problem. The Govt. is getting nominal revenue from local supply of knitted garments.

5.12.4 Use of Dyes and Chemicals

Undue input tax adjustments is sometimes claimed by showing purchase invoices of dyes and chemicals in excessive quantity which are far more than the normal requirements of the unit. In some cases undue input tax is also claimed by showing purchases of chemicals which are not used in the knitting industry.

5.12.5 Relevance of installed machines

Width of fabric depends upon the dia of circular knitting machine. But sometimes supply of such fabric is shown which cannot be or is not knitted on the installed knitting machine. This is done to claim input tax adjustment on knitted fabric which is purchased from the unregistered suppliers on which no tax is paid at any stage.

5.12.6 The aspect of value addition

Knitted products are premium price goods and should have substantial value addition compared with the value of the raw materials used. But sometimes nominal value addition is shown to suppress the amount of output tax on local supplies despite the fact that input tax is claimed by showing the use of yarn of higher count and costly raw materials.

5.12.7 Excessive Wastages.

Excessive wastages are claimed to lower the out put tax despite the fact that full amount of input tax is claimed on yarn and raw materials.

5.12.8 Non payment of tax on local supply B grade products and rejections are sold in the local market but either the supply is not shown in the sales tax records by claiming excess wastages or their value of supply is substantially suppressed to evade payment of sales tax

5.13 Audit Guidelines

5.13.1 Quantity and count of yarn

TPI (twist per inch) in knitting yarn for fleece garments of specific requirement is less and therefore it is called "soft yarn". Similarly, knitted fabric and value added products are exported which require better quality yarn which is generally not made by all Spinning Mills. It is to be seen whether the supply invoices of yarn are from a spinning unit which is known for manufacturing knitting yarn. The production record of spinning mills can easily lead to any conclusion. Moreover, keep in mind the normal counts which are used in the knitting industry, and in case finer counts of yarn are shown to have been used in the manufacturing of knitted fabrics, further probe needs to be made to arrive at the factual position.

5.13.2 Capability of supply with installed capacity

In case supply of knitted fabric is shown far in excess of the installed capacity of knitted machines of a unit, it may be inquired as to how and wherefrom this excessive quantity has been procured . If it is claimed to have been got knitted through vendors, get particulars of those vendors for ascertaining their tax liability.

5.13.3 Capabilities of the installed machines

LYCRA cannot be knit on all machines nor LYCRA fabrics can be produced on all machines. Same is the case in dying machines; Polyester cannot be dyed in wenches as Jets are required in the dying of Polyester or PC cloth. While auditing a knitting unit the auditor should keep in mind the actual machines installed there and see whether the input tax invoices being claimed for different items/processes have any relevance with the production line of the unit.

5.13.4 Input on oils

Input tax adjustments is claimed showing invoices of oil without showing specification of oil. Such input is to be admissible if it relates to machine oil and not oil of general nature.

5.13.5 What is the disposal of unused yarn over cones. Sales Tax is payable on supply of used paper cones and PP bags.

5.13.6 Highly sophisticated and modern knitting machines need lesser replacement of needles. In case a unit is modern, whether input tax adjustment being claimed on purchase invoices of higher quantity needles is really a requirement of that unit or not.

5.13.7 Matching of count on shipping documents and purchase invoices may reveal certain discrepancy. The auditor should match the count declared on shipping documents of exported knitted products to match with the purchase invoices of yarn. There is a possibility that someone may claim input/refund on yarn purchase invoices of higher count, whereas the yarn count shown on shipping documents is of lower side.

KNITTING

Summary of Important Information

1. Commonly Produced Fabrics

Fabric Type	Yarn Type	Lycra	Yarn Count	GSM
Plain	100% cotton, P/C & C/P	20 to 70 denier	12/1 – 40/1	90-280
Pique, single, double, Lacoste	100% cotton, P/C & C/P		16/1-40/1	140-350
Double knit, Rib	100% cotton, P/C & C/P		16/1-40/1	140-450
Interlock	100% cotton, P/C & C/P		24/1-40/1	180-350
Fleece	100% cotton, P/C & C/P		20/1-40/1 Face 6/1-16/1 Loop	240 -500
Terry	100% cotton, P/C & C/P		10/1-40/1	150-350
Honeycomb	100% cotton, P/C & C/P		16/1-40/1	140-350

2. Consumption Formula For Electricity And Gas

Consumption of	Units	Consumption
Electricity	Kilowatt Hour	0.75-0.9813
Gas	Mm BTU	0.072-0.084
	Hectameter	0.0214-0.025

1. Average Conversion Charges

Fabric	Conversion Rs/kg
Single Jersey	Rs. 9-10/Kg
Rib, Double Knit	Rs. 12-14/Kg
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Interlock	Rs. 12-14/Kg
Pique, Lycost	Rs. 9-10/Kg
Fleece	Rs 11-12/kg
Lycra knitting	For Lycra Rs. 5/kg are added to the normal knitting rate

4. Production Formula for Knitting

- For plain and 1x1 Rib fabric

$$\text{Linear Meters/ hour} = \frac{\text{m/c RPM} \times 60 \times \text{Nos. of feeders} \times \text{efficiency\%}}{\text{Courses/cm} \times 100}$$

- For interlock fabric

$$\text{Linear Meters/hour} = \frac{\text{M/c RPM} \times 60 \times 100 \text{ of feeders} \times \text{efficiency\%}}{2 \times \text{courses / cm} \times 100}$$

- $\text{Kg/hour} = \frac{\text{GSM} \times \text{Sq. m fabric produced/hr}}{1000}$

5. Overall Wastage in Knitting

Description	Average wastage
Units not using dyed yarn for their production	35%
Units using both un-dyed and dyed yarn for their production	40%
Units using entirely dyed yarn for their production	45%

6. Sale Value of Knitting Waste/Rejection

▪ Yarn waste	Rs.	5/Kg
▪ Brushing	Rs.	2/Kg
▪ Shearing	Rs.	2/Kg
▪ Cutting	Rs.	4/Kg
▪ Over lock	Rs.	0.62/Kg
▪ Embroidery	Rs.	5/Kg
▪ Garments (Men's)	35-40% of the A-grade price when sold in the local market	
▪ (Women's)	15-20% of the A grade price when sold in the local market	

7. Wastage in Woven Garments

▪ Cutting	12-14%
▪ Stitching	1-1.5%
▪ Garment rejection	2-3 %

8. Wastage for Garments requiring Washing/After-treatment

▪ Simple Wash	2-3%	or
▪ Stone Wash	4-5%	or
▪ Sand Blast	6-7%	or
▪ Fashion garment-non-stretchable	5-6%	or
▪ Fashion Garment-stretchable	7-8%	or
▪ Over dyed/dirty look	5-6%	

9. Material Wastage for Made-ups

Made –ups are segregated into two categories, namely, small and large.The small made-ups includes pillowcases and cushions etc. The large made-ups include bed sheets, quilt covers, fitted sheets, cushions etc. Wastage percentages in made-ups is as under:-

<u>A- SMALL</u>

▪ Printed	2-3% or
▪ Bleached-white	4-5% or
▪ Pastel-light colors	4-5%
▪ Dark dyed	2-3%

B- LARGE

- Bleached-white 6-7% or
- Light & pastel colors 6-7% or
- Printed & dark dyed 4-5%

10. Material Wastages in Sock Manufacturing

Maximum = upto 15%

Breakup

- Invisible waste 1-2 %
- Knitting of socks 2-3 %
- Dying of socks upto 3%
- Rejection on stiching, pressing etc 4%-5%

11. Commonly Produced Garment Parameters

Garment	Fabric type	Weight
T-shirts	Single jersey (S/J), Interlock(I/L)	200 – 300grams
Polo T-shirt	S/J, PK	250-350 grams
v-neck full sleeve	I/L, Rib, fleece	300-600 grams
Round neck(crew neck) full sleeve	I/L, rib, Fleece	300-600 grams
Track suit full	Fleece fabric	600-900 grams

12. Estimated Normal Value Addition in Knitting & Garments

Process	Value addition	Amount	Remarks
Knitting	Per Kg of yarn	Rs.10-15	Depends on type of fabric-average cost
Bleaching	Per Kg of fabric	Rs. 30-60	Average cost
Dyeing & bleaching	Per Kg of fabric	Rs. 40-90	Average cost
Finishing	Per Kg of fabric	Rs. 20-25	Average cost
Stitching	Rs. 100/ pre dozen to Rs. 600/per dozen		

Chapter 6

CANVAS & TENT MANUFACTURING

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CHAPTER 6

CANVAS AND TENT MANUFACTURING

6.1 Introduction

6.1.1. Scope of Industry

The tent manufacturing in Pakistan is established since Independence of Pakistan. In 1991 this industry was introduced in the international market during Gulf War. However, Cosovo War in 1999 changed the whole scenario and Pakistan's name as exporters of tents became recognized. The main local markets in Pakistan for tents & tarpaulin are located at Landa Bazar Lahore, Jodia Bazar Karachi, Raja Bazar Rawalpindi and Kisa Khawani Peshawar, where the unregistered sellers make most of the supplies. The export-oriented units are mostly located in and around Lahore and Karachi. These export-oriented units are members of Pakistan Canvas and Tents Manufacturers and Exporters Association and are registered with Sales Tax.

Table 6.1
Export Oriented Units

Type of units	No. Of Units
Composite	12
Semi Composite	20
Having one process i.e. dying or weaving or cutting and stitching etc.	68
Total units	100

Note: A composite unit means having at least three/four process facilities and a semi composite unit means units having at least two process facilities.

Source: Pakistan Canvas and Tent Manufacturers and Exporters Association

6.1.2. Main Components of Tent

Essentially being an order based industry, there is no continuous and regular tent manufacturing activity of the sector. As such normally no significant stocks of finished goods are available with the units. The percentage composition of tents with regards to raw materials is as follows which, of course, may vary depending upon the ordered design:

- Yarn (in shape of canvas, Do Sooti, inner lining treated or otherwise) is 75%
- Poles (made of iron or wood) is 10% - 15%
- Other accessories (ropes, eyelets, zippers etc.) is 10% - 15%

6.1.3. Terms Used in Tent Sector

6.1.3.1 The tents mainly compose of a fabric known as CANVAS. This is a close woven fabric made from coarse hard-twisted yarns from 2 – 6 ply in the plain/any type of weave, in various weights, compositions and impregnated.

6.1.3.2 Term FLY is used to denote the roof of the tent. Single fly means that roof is of single layer and double fly means that roof constitutes of two layers with a maximum of four fly depending on the buyer's demand.

6.1.3.3 The term FOLD used in this industry means the layers used in the fly/walls of the tent. The tents are usually single, double or triple fold.

6.1.3.4 Another term SIZE represents the floor area covered by the tent and usually does not represent the height or any other specifications. However, in some cases height may also be mentioned.

6.1.3.5 The tents are also subject to special processing/usage which include waterproofing, fire/ flame retarding, rot proofing, ground sheeting, designed for air conditioning, velvet inner, curtains, polyester wadding layer for cold weather, air tight etc.

6.1.4. Pricing of Tents

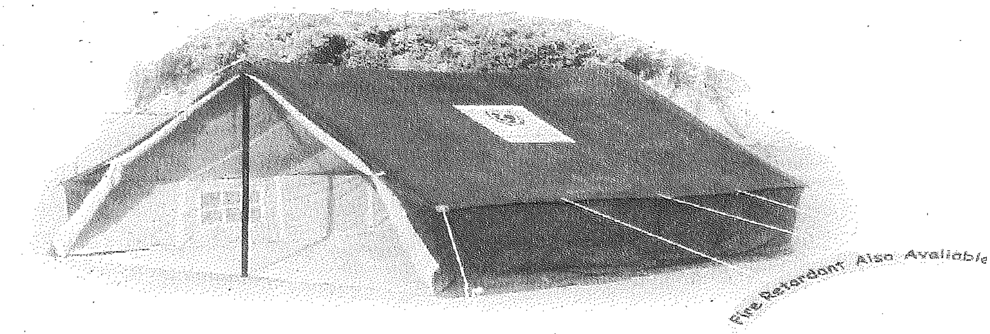
Comparing the different selling prices can assess the usage of raw materials and special treatment. Normal tent's export price ranges from US $1.5 to 2.2 per Kg of tent. As a normal practice the export invoices are also certified by the aforesaid Association and contain particulars of tents regarding any special treatment if the price exceeds the above range.

6.1.5. Designs / Sizes of Tents

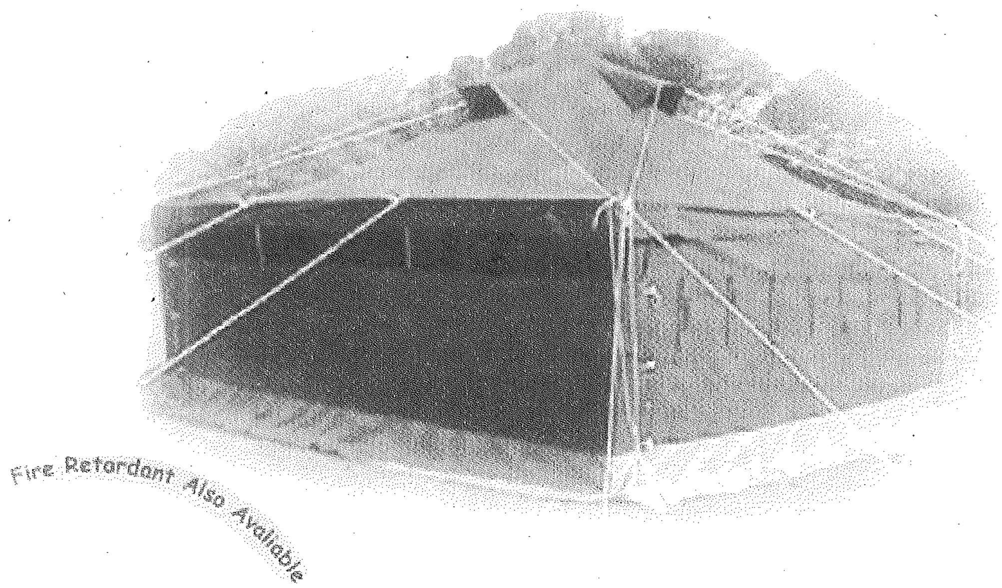
The tents are manufactured in different designs/ sizes and varied materials depending upon its utility and demands of the customer. The tents are made according to size and specifications of the customers. A few types of tents are given below:

(Double Fly) Ridge Type Standard Version Tent

EXTREME WINTER CLIMATE TENT

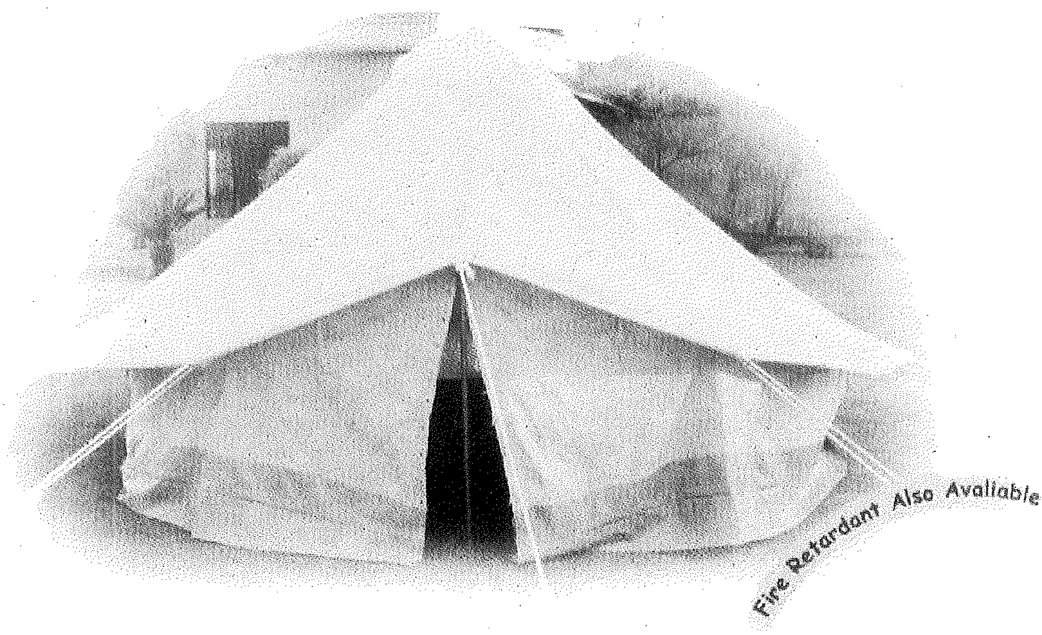


SINGLE FLY, DOUBLE FOLD (Ridge Type Tent)



AFRICAN TENT , RECTANGULAR , 25 M2 - Single Fly, Single Fold:

REFUGEE TENT FOR AIR LIFT
(Single Fly, Single Fold) Ridge Type Tent

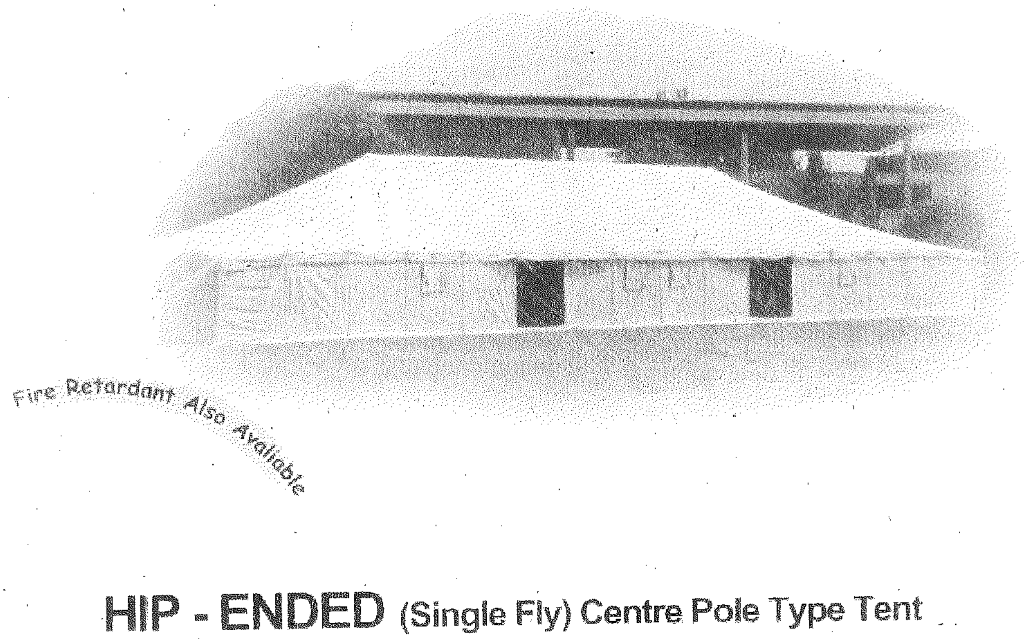


ROUND FAMILY (Double Roof) Center Pole Type Tent

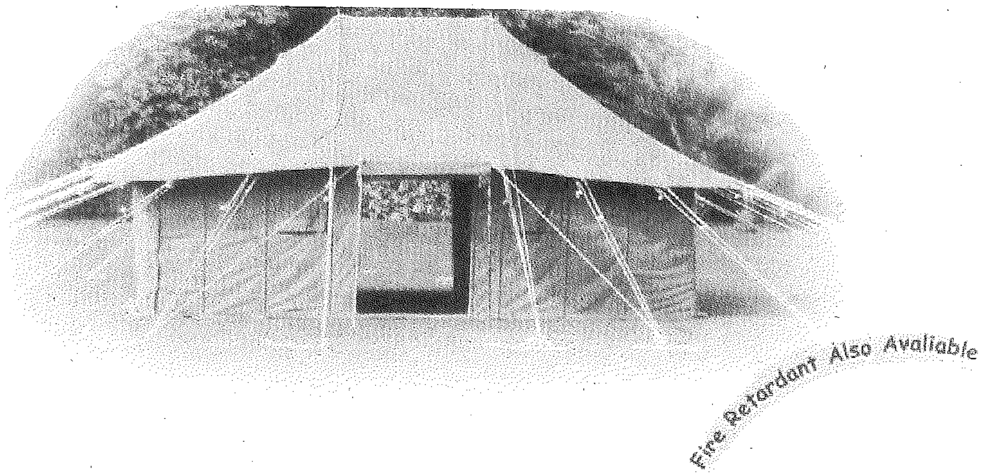
MARQUEE UNIVERSAL GS (Double Fly) Center Pole Type Tent

DISPENSARY (Single Fly) Frame Type Tent

70M2 STORAGE (Single Fly) Frame Type Tent

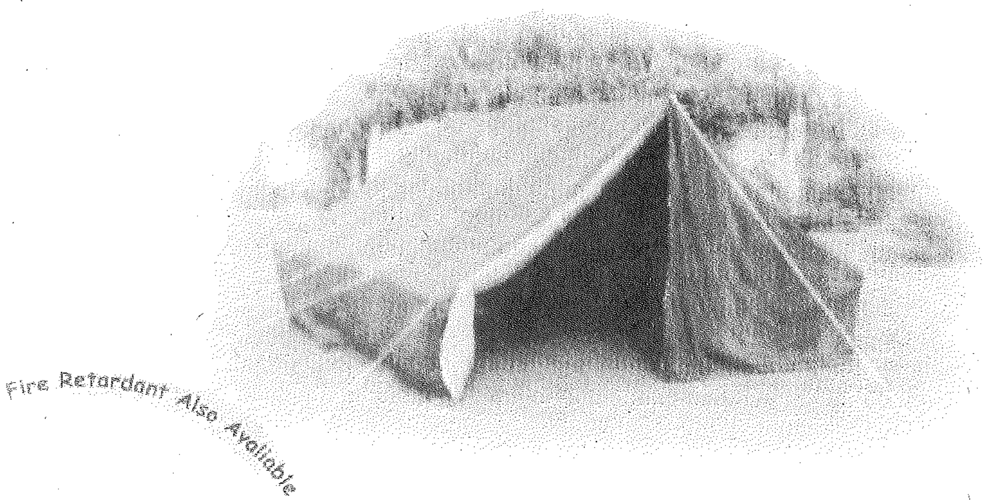


HIP - ENDED (Single Fly) Centre Pole Type Tent



MILITARY (Double Fly) Center Pole Type Tent

SWISS COTTAGE (Double Fly) Center Pole Type Tent



MILITARY (Single Fly) Ridge Type Tent

BATH TENT (Single Fly)

6.2. WEAVING OF FABRIC FOR TENTS etc.

6.2.1. Fabrics Manufactured in Kasur

Canvas being the major portion of tent is woven on unorganized looms sector concentrated in Kasur (Punjab). Loom industry in Rukan Pura, Basti Chargh Shah and Basar Pura Road areas of Kasur weaves different types of fabric for different usages. This is cottage type and small-scale industry and looms are not registered with sales tax. Mostly people have installed (2 to 8 loom average) in their houses and weave the following fabrics on labor / conversion charges:

- Canvas of different constructions which is almost fifty percent of the total activity
- Dosooti for lining in the tent
- Lattha for usage in tents
- Lattha for football lining mostly used in Sialkot. This is also called Dosoota.
- Pile-less Towel locally known as Huckaback.
- Duster Flannel
- Mosquito net
- Rexin lining
- Fabric for Judo Karate

Source: Pakistan Canvas and Tent Manufacturers and Exporters Association

6.2.2. Khata: It means a unit of four looms. One person can work on 4 looms. These are conventional looms and mostly manufactured in Faislalbad.

6.2.3. Doubling Units: Approximately seventy doubling units are operational in Kasur.

6.2.4. Units: Approximately 10000 to 12000 units are situated in Kasur. A unit has two to eight looms. However, about 20 units have more than eight looms.

6.2.5. Weaving Charges: The conversion charges range between 20 - 25 paisas per ounce. This is contrary to woven fabrics, the conversion charges of which are determined on per pick basis.

6.3. Raw Material Used in Tents Industry

6.3.1 Yarn and Fabric etc. For Tents

Different counts of yarn for making canvas, ropes, lining and Dosooti etc. usually ranges from 1.5 to 24 count (refer table 6.2). The yarn is usually Open End, though ring spun is also used. The yarn usually used is 100% cotton. Occasionally P.C. (Polyester mixed depending upon the quality of polyester and cotton) or P.V. (Viscose mixed) yarn is also used. These yarns are used to make canvas of various weights, sheeting, dosooti, lattha etc. The weight of canvas is usually referred to ounces per yard instead of pounds per yard, as is in the case of other woven fabrics. The composite units generally make fabric and rope themselves. The uses of different counts of yarns are as follows:

Table 6.2
Usage of Different Counts of Yarn

Product	Count of Yarn
Ropes	1.5 s- 10s
Canvas	7s – 12s rarely 16s & 30s count is used
Niwar	6 s – 10 s
Lining (Lattha)	10 s – 22 s
Dosooti	20 s – 30 s

Note: 1- Normally the ropes are made of fresh 10s, but at times left over 20s – 30s is also used for making cotton ropes.
2- In rare cases printed bed sheet fabric, curtain cloth or any blended printed fabric made from yarn up-to 40 count is also used.

Source: Pakistan Canvas and Tent Manufacturers and Exporters Association

6.3.2. Dying, Water Proofing and Special Processing Chemicals

6.3.2.1 Dyes: two types of dyes are normally used i.e. direct dyes and sulpher dyes (refer Para 4.5). Sodium Sulphide is an example of sulpher dye.

6.3.2.2 **Paraffin Wax:** This is used for waterproofing. Stearic acid is used for melting of paraffin wax. This process adds about 17% of weight e.g. if 17 ounces per square yard waterproof canvas is required then the canvas of 14 ounces per square yard is woven. Wax is applied 4 ounces per square yard of which 1 ounce is burnt during the process and only 3 ounces weight gain is left.

6.3.2.3 **Acetic Acid:** This chemical is used with liquid Ammonia to have a better quality waterproofing. Chemicals such as Alum Sulphate, Ammonia bi-carb and PVA are also used in this process.

6.3.2.4 **Copper Naphthalene:** This chemical is used for rot proofing i.e. an anti fungal treatment.

6.3.3 Accessories

a. Poles made of iron, wood, aluminum and bamboo.
b. Pegs made of wood, metals, etc.
c. Ropes made of cotton, nylon etc.
d. Tape made of cotton, nylon etc.
e. Niwar made of cotton, nylon etc.
f. D. Rondos.
g. Mochi Dhagha.
h. Eyelets of various quality (Aluminum, Copper, Steel etc.)
i. Zipper
j. Mosquito Nets
k. Wooden Sticks
l. Hammer, Mallet
m. Polypropylene Sheet
n. Hessian Cloth

o. Packing Tape Steel or Nylon Type.

6.4 Manufacturing Process

6.4.1 The composite units purchase yarn, which is converted into multi-ply yarn on doubling machines and then yarn is twisted on twisting looms. It is then sent to Loom Section and is converted into Canvas. The yarn is sized at sizing machines for Dosooti, lining, lattha and curtain cloth only. The canvas does not need sizing. The looms used for weaving are of two types i.e. shuttle looms and shuttle less looms.

6.4.2 Canvas is sent for finishing process and as per requirement; it is dyed/bleached/semi leached/water proofed/rot proof/fire retardant/low in-flammability process.

6.4.3 The printing process is also different in different cases. Lining material generally requires block printing, spring printing, rotary printing etc. However, this process is rarely used.

6.4.4 The finished canvas/ fabric is sent for cutting, either manually or machine cutting.

6.4.5 There are two types of stitching machine for stitching of tents, which are heavy-duty Jockey and Singer machines. Tents are also hand stitched. After stitching the finishing process completes.

6.5 Machinery Involved in Tent Manufacturing

For Yarn Manufacturing
Textile Machinery/Rotary/Spindles
Sizing Machines

Doubling and Twisting Machines

Canvas Weaving Looms

Stitching Machines

Dyeing Water Proofing Plants

Dryers etc

Packing Machines

6.6 Doubling and Twisting

For the weaving of canvas, multi-ply (doubled) yarn is used, which ranges from 2 – 6 ply. This process is done to strengthen the yarn, which is suitable for canvas weaving, so that the canvas should be rugged. This is an essential process for weaving of canvas and results in reduction of count.

6.7 Production Formula

6.7.1 Formula to Calculate Weight of Fabric

- <u>If the warp and weft count are same:</u>
  (Ends per inch + picks per inch) x ply of yarn x width of fabric / (Warp or Weft count x 840) = pounds/ yard

- <u>If the warp and weft count are different</u> then yarn weight for warp and weft are calculated separately and then add to arrive at total weight:

<u>For warp weight</u>

(Ends per inch) x ply of yarn x width of fabric / (Warp count x 840) = pounds/ yard

<u>For weft weight</u>

(Picks per inch) x width of fabric / (Weft count x 840) = pounds/ yard

Note:

- For conversion from pounds per yard to ounces per yard, multiply by 16.
- This table does not include 10% shrinkage
- This table does not include 2 - 4% count variation, which must be added

Table 6.3
Constructions of Canvas and their Weights

Ends per inch	Picks per inch	Warp Count	Warp Ply	Weft count	Weft Ply	Widht in inches	Weight in Ounces	Shrinkage +count variation in ounces 12%	Total
46	26	10	2	10	2	36	9.87	1.18	11.06
46	26	10	2	10	3	36	11.66	1.40	13.06
46	26	10	3	10	3	36	14.81	1.78	16.59
46	26	10	4	10	4	36	19.75	2.37	22.12
46	26	10	3	10	6	36	20.16	2.42	22.58
46	26	10	2	10	2	56	15.36	1.84	17.20
46	26	10	2	10	3	56	18.13	2.18	20.31
46	26	10	3	10	3	56	23.04	2.76	25.80
46	26	10	4	10	4	56	30.72	3.69	34.41
46	26	10	3	10	6	56	31.36	3.76	35.12
46	26	10	2	10	2	75	20.57	2.47	23.04
46	26	10	2	10	3	75	24.29	2.91	27.20
46	26	10	3	10	3	75	30.86	3.70	34.56
46	26	10	4	10	4	75	41.14	4.94	46.08
46	26	10	3	10	6	75	42.00	5.04	47.04

Source: Pakistan Canvas & Tent Manufacturing & Exporter Association

6.7.2 Formula to Calculate Daily Production of Canvas on Weaving Looms

The productions given in the tables below may vary depending upon the quality of looms, quality of yarn and working conditions.
(RPM x minutes per hour x hours per day x efficiency) / No. of picks per inch / (inches per yard x 1.0936) = Linear meters per day

Table 6.4
Shutle Loom (Production in Mtrs Per Day at 60% Efficiency

No. of Picks per inch	Fabric width & respective RPM			
	75	inches	75	inches
	80	Rpm	100	Rpm
	L.Mtrs	Sq. Mtrs.	L.Mtrs	Sq. Mtrs.
24	73	139	91	174
26	68	129	17	33
28	63	119	18	35
30	59	111	20	38
32	55	105	21	40
34	52	98	22	43
36	49	93	24	45

Source: Pakistan Canvas & Tent Manufacturing & Exporter Association

6.8 Wastage in Canvas, Tents, Tarpaulines &Canvas Made-Ups

	Wastage (in weight)
• **Overall Wastage**	**Not more than 12%**
Break up	
Step 1: Yarn Doubling and Twisting or sizing	1% Invisible
Step 2: Weaving Shuttle Loom	1 - 2% Invisible
Shuttle-less Loom	2 - 3% (2% visible) (1% invisible)
Step 3: Dyeing/Waterproofing/ Impregnation	
Dyeing (Tents lining and Canvas)	2 - 4% Invisible
Paraffin Wax.	25% Invisible (Burnt).
Detergent for washing/Dyes & Chemicals for designing/ Scouring.	As there is no weight gain therefore 100% wastage
Step 4: Cutting/Stitching at Tent Making Stage.	4% to 5% (Visible)

Note: The overall wastage of a composite unit making complete tents must not exceed 12%.

An Example of Dyeing Receipe

This formula is for dying olive green of 500 meters of canvas with a width of 66 inches and construction of 10x10 2-ply yarn.

Table 6.5

Receipe for Dyeing

Name of Chemical / Colour	Weight in grams
Khaki	1600
Yellow	1680
Black	850
Bodax or Boron colour	100
Dark green	100
Sodium	6500
Acetic Acid	3000
Potassium Bichromate	3115

Source: Pakistan Canvas and Tent Manufacturers and Exporters Association

6.9 **Table 6.6**

Selling Prices of Different Types of Waste

Name of Process	Name of waste	Selling Price in Rs.
Sizing	Gully left over of yarn	Half price of yarn
Weaving	Gully left over of yarn	One third price of yarn
	Kinari	20 – 25 / kg
Cutting and stitching	Small pieces (Kathran)	2 – 6 / Kg.
	Large Pieces	Used internally
	Metal accessories	8 – 10 / kg.

Source: Pakistan Canvas and Tent Manufacturers and Exporters Association

6.10 **Table 6.7**

Value Addition by Different Processes

Name of Process	Value addition in Rs.
Doubling / Twisting	2.00 – 2.50 / pound
Weaving	4.00 – 6.00 / pound
Dyeing / waterproofing	
Tents Lining	
Light shades with direct dyes	1.50 – 2.00 / Sq. Yard
Dark shades with direct dyes	2.50 – 4.00 / Sq. Yard
Special Dyes	6.00 – 35.00 / Sq. Yard
Canvas	
Direct and Sulpher Dyes	9.00 – 10.00 / Sq. Yard
Vat and special dyes	25.00 – 35.00 / Sq. Yard

Source: Pakistan Canvas and Tent Manufacturers and Exporters Association

6.11 Issues Relating to Sales Tax

6.11.1 Non Registration

The looms, which are producing the canvas and allied products, are concentrated in Kasur. All these units are unregistered. It is estimated that about 40000 looms are installed in three different areas of Kasur.

6.11.2 Local Sale

The canvas and tent manufacturers making local supply are not registered. The biggest market is situated in Landa Bazar, Lahore, Jodia Bazar, Karachi, Raja Bazar, Rawalpindi and Kisa Khawani, Peshawar.

6.11.3 Incomplete Declaration

The invoices of tents issued by this industry do not contain the particulars of yarn count and construction of the fabric, which indicates use of flying invoices of yarn.

6.11.4 Undue Input Tax on Yarn

Certain units claim input tax adjustment / refund on finer count yarn, i.e. greater than 30 count normally and rarely 40 count. This is contrary to the normal usage of yarn in this industry and as such is detrimental to sales tax revenue.

6.11.5 Input on Chemicals

The input tax on chemicals claimed to be used in the process may not be correct. There are chances that input tax on chemicals might be claimed which are not used in this industry or if used the quantity shown may be higher. An example is that no sizing material is used for canvas but sometimes input of sizing material is also claimed.

6.11.6 Use of Flying Invoices

The units having the dying facility might not have the gas connection. Such units are using furnace oil. It is very difficult to establish some relationship of consumption and production. This may result in undisclosed commercial dying and loss of revenue or use of flying invoices of dyes and chemicals to claim undue input tax adjustment / refund.

6.12 Audit Guidelines

6.12.1 Wastage Allowance

The wastages allowance will vary from unit to unit. A composite unit can claim all the wastages but a semi composite unit or units having anyone of the processes should not be entitled for all of the wastage allowance.

6.12.2 Input Tax on Accessories

In case of accessories sales tax invoices of all the items is not available. The sales tax invoices are available for the following items:

- Poles of iron and steel
- Pegs of metals
- Ropes of cotton and nylon
- Zipper
- Polypropylene sheets
- Hessian cloth

6.12.3 Usage of Fine Count Yarn

If any unit shows the usage of yarn counts over and above the counts, given in table 6.2, it should be investigated. Costing in such case may be done to ensure that the cost of raw materials, labour charges and overheads does not exceed the selling price of tents. The verification of the invoices from the Association must be sought.

6.12.4 Genuineness of Export

The gross weight exported should be compared with the number and size of containers included in the export shipment. The maximum weight that can be carried by 40 feet container is 25 tons and 20 feet is 12.5 tons for tents. In case of canvas, tarpaulins, bags and allied products 16 – 17 tons of weight can be loaded in 20 feet container. In case the weight of tents in a shipment increase abnormally from this range, the genuineness of export documents needs to be checked.

6.12.5 Input Tax Invoices Vis-à-vis Production

Normally left over yarn is used for manufacturing ropes because it is cheaper. However, 10s yarn may be bought for this purpose if specific requirement of the buyer. This may be verified from the orders placed by the buyers in order to check whether the yarn shown for manufacture of ropes has really been used.

CANVAS AND TENT MANUFACTURING

Summary of Important Information

1. Main Components of Tent by Weight

- Yarn (in shape of canvas, Do Sooti, inner lining) --75%
- Poles (made of iron or wood) -- 10% - 15%
- Other accessories (ropes, eyelets, zippers etc.) -- 10% - 15

2. Yarn Count of Products Used in Tents Industry

Product	Count of Yarn
Ropes	1.5 s- 10s
Canvas	12s rarely 16s & 30s count is used
Niwar	6 s – 10 s
Lining (Lattha)	10 s – 22 s
Dosooti	20 s – 30 s

3. Dying, Water Proofing and Special Processing Chemicals

(i) **Dyes:** direct dyes and sulpher dyes Sodium Sulphide is an example of sulpher dye.

(ii) **Paraffin Wax:** This is used for waterproofing. Stearic acid is used for melting of paraffin wax. This process adds about 17% of weight. Wax is applied 4 ounces per square yard of which 1 ounce is burnt during the process and only 3 ounces weight gain is left.

(iii) **Acetic Acid:** This chemical is used with liquid Ammonia to have a better quality waterproofing.

(iv) **Copper Naphthalene:** This chemical is used for rot proofing i.e. an anti fungal treatment.

4. Doubling and Twisting

For the weaving of canvas, multi-ply (doubled) yarn is used, which ranges from 2 – 6 ply.

5. Production Formula

- **<u>If the warp and weft count are same</u>**
  (Ends per inch + picks per inch) x ply of yarn x width of fabric / (Warp or Weft count x 840) = pounds/ yard

- **<u>If the warp and weft count are different</u>** then yarn weight for warp and weft are calculated separately and then add to arrive at total weight:

  <u>For warp weight</u>

  (Ends per inch) x ply of yarn x width of fabric / (Warp count x 840) = pounds/ yard

  <u>For weft weight</u>

  (Picks per inch) x width of fabric / (Weft count x 840) = pounds/ yard

Note:

- For conversion from pounds per yard to ounces per yard, multiply by 16.
- Add 10% on account of shrinkage (the shrinkage is 10% because the yarns are usually doubled and therefore become thick)
- Add 2 - 4% on account of count variation

6. Daily Production Formula for Canvas Weaving

(RPM x minutes per hour x hours per day x efficiency) / No. of picks per inch / (inches per yard x 1.0936) = Linear meters per day

7. Wastage in Canvas, Tents, Tarpaulines &Canvas Made-Ups

	Wastage (in weight)
• **Overall Wastage**	**Not more than 12%**
Break up	
Step 1: Yarn Doubling and Twisting or sizing	1% Invisible
Step 2: Weaving Shuttle Loom	1 - 2% Invisible
Shuttle-less Loom	2 - 3% (2% visible) (1% invisible)
Step 3: Dyeing/Waterproofing/ Impregnation	
Dyeing (Tents lining and Canvas)	2 - 4% Invisible
Paraffin Wax.	25% Invisible (Burnt).
Detergent for washing/Dyes Chemicals for designing/ Scouring.	As there is no weight gain therefore 100% wastage
Step 4: Cutting/Stitching at Tent Making Stage.	4% to 5% (Visible)

8. Selling Prices of Different Types of Waste

Name of Process	Name of waste	Selling Price in Rs.
Sizing	Gully left over of yarn	Half price of yarn
Weaving	Gully left over of yarn	One third price of yarn
	Kinari	20 – 25 / Kg
Cutting and stitching	Small pieces (Kathran)	2 – 6 / Kg
	Large Pieces	Used internally
	Metal accessories	8 – 10 / Kg

9. Value Addition by Different Processes

Name of Process	Value addition in Rs.
Doubling / Twisting	2.00 – 2.50 / pound
Weaving	4.00 – 6.00 / pound
Dyeing / waterproofing Tents Lining Light shades with direct dyes Dark shades with direct dyes Special Dyes	 1.50 – 2.00 / Sq. Yard 2.50 – 4.00 / Sq. Yard 6.00 – 35.00 / Sq. Yard
Canvas Direct and Sulpher Dyes Vat and special dyes	 9.00 – 10.00 / Sq. Yard 25.00 – 35.00 / Sq. Yard

Chapter 7

TOWEL MANUFACTURING

List of paragraphs

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Chapter 7

Towel Manufacturing

7.1 Introduction

The primary function of a terry towel is to absorb moisture from wet skin. It must, however, be strong enough to withstand the strain of rubbing and pulling, twisting and tugging of the user, and of constant laundering. Terry towels are made either of all-cotton or a combination of cotton and polyester. While polyester provides increased strength, lighter weight, faster drying after laundering, and less shrinkage, all-cotton towels provide greater absorbency.

Towel manufacturing sector utilized the machine specifically designed to make towel fabrics. These are known as towel looms. These machines are installed in some of the big unit in organized sector. But majority lies in unorganized sector. In unorganized sector their machine mechanism is similar to shuttle weaving. Hence its all parameters to production and costing is similar to shuttle weaving.

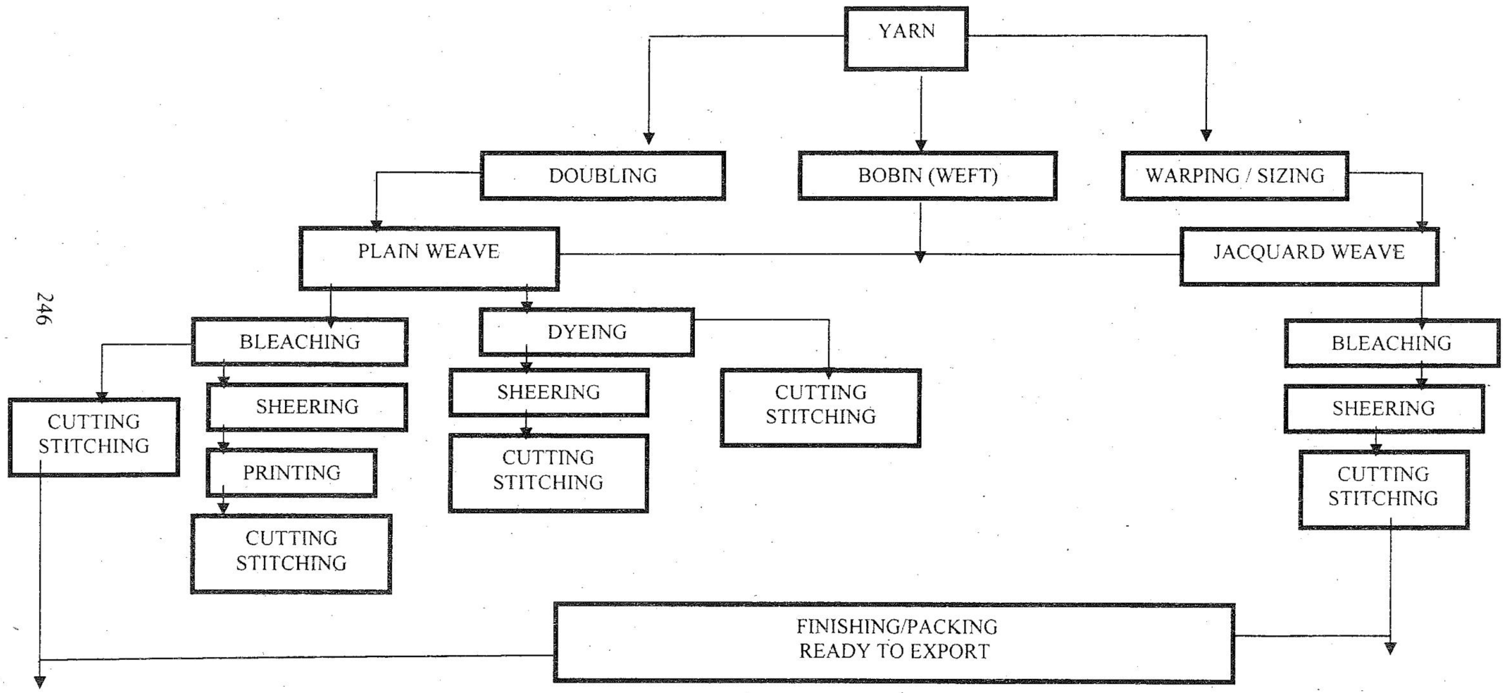
7.2 Manufacturing Process

The various stages of manufacturing towel are indicated in the following flow chart. The weaving and processing stages of this chart are the same as described in chapter No. 3 and 4. However, these processes are illustrated in the subsequent figures.

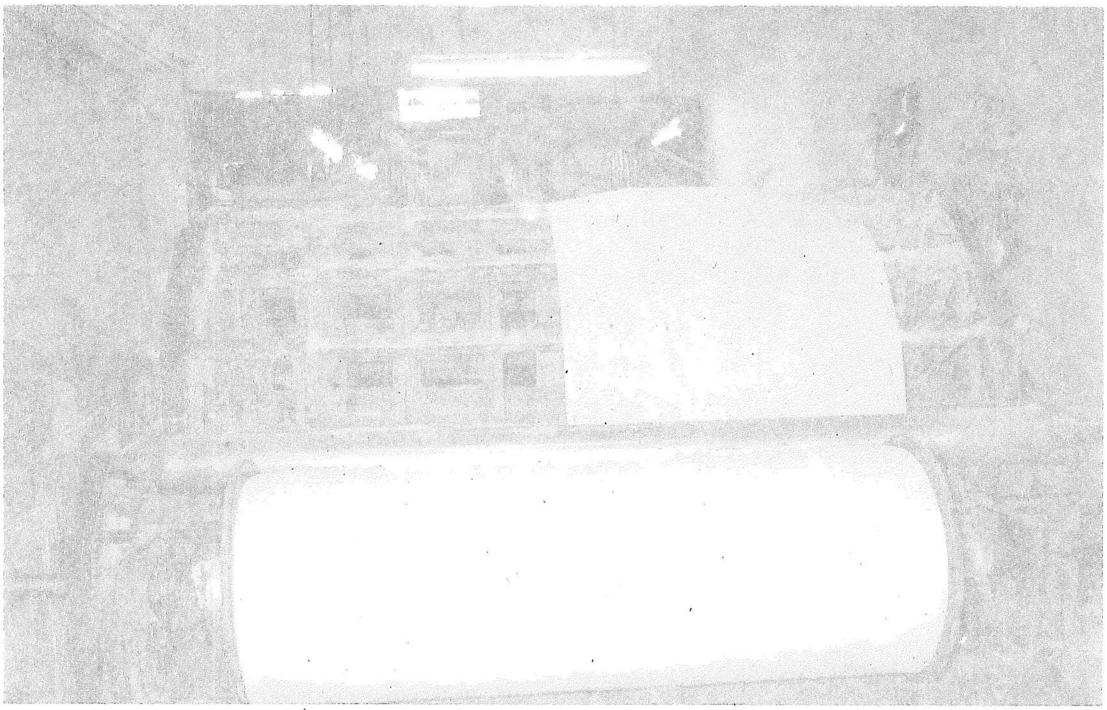
7.2 Manufacturing Process

The various stages of manufacturing of towel are as under:-

FLOW CHART

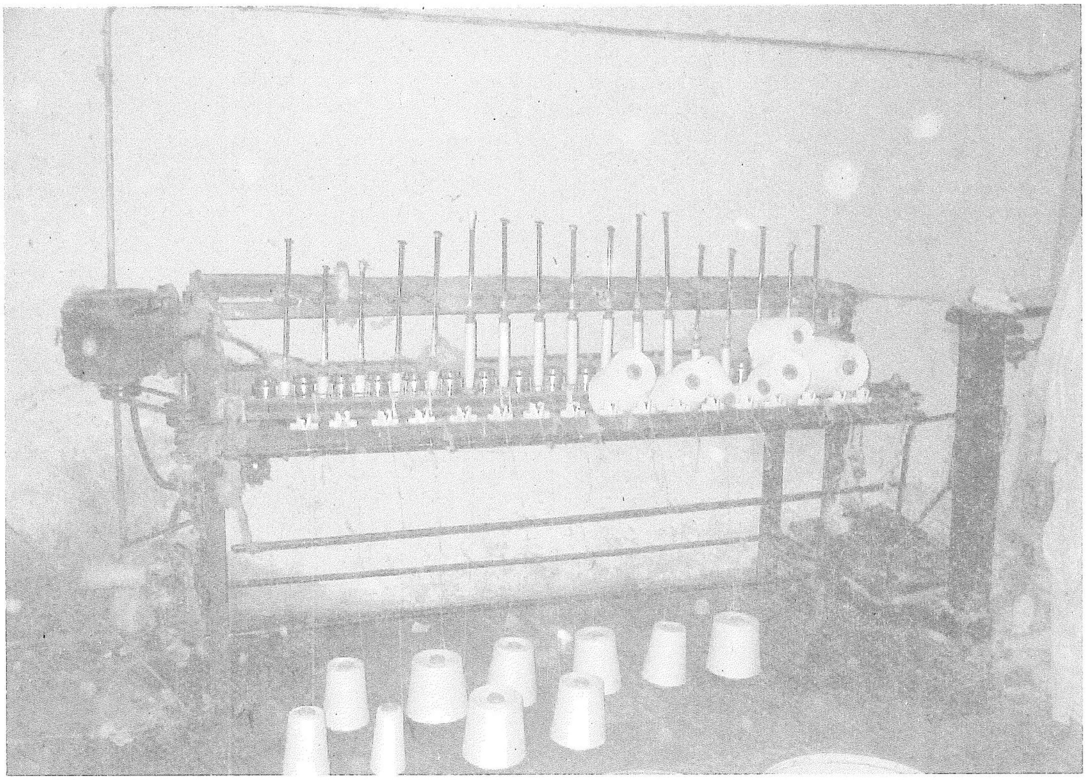


Note: The weaving and processing stages are the same as discussed in chapter 3 and 4. However, these processes are illustrated in the following figures.

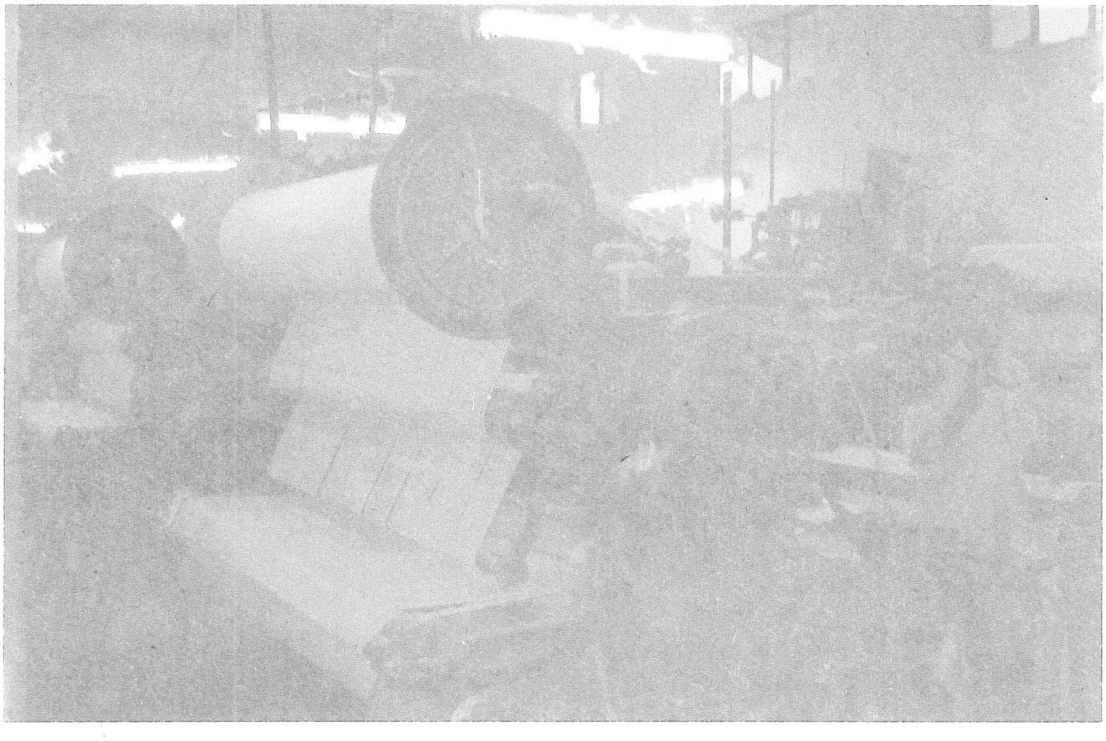


Warping

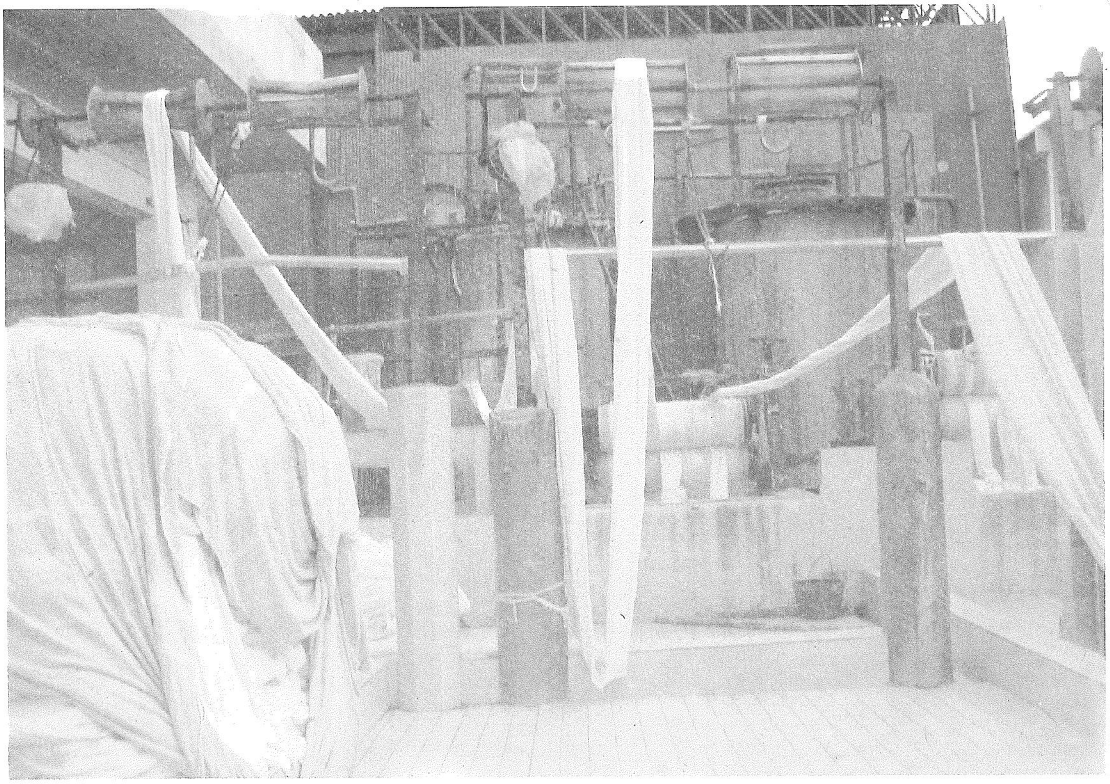
Twisting / Doubling



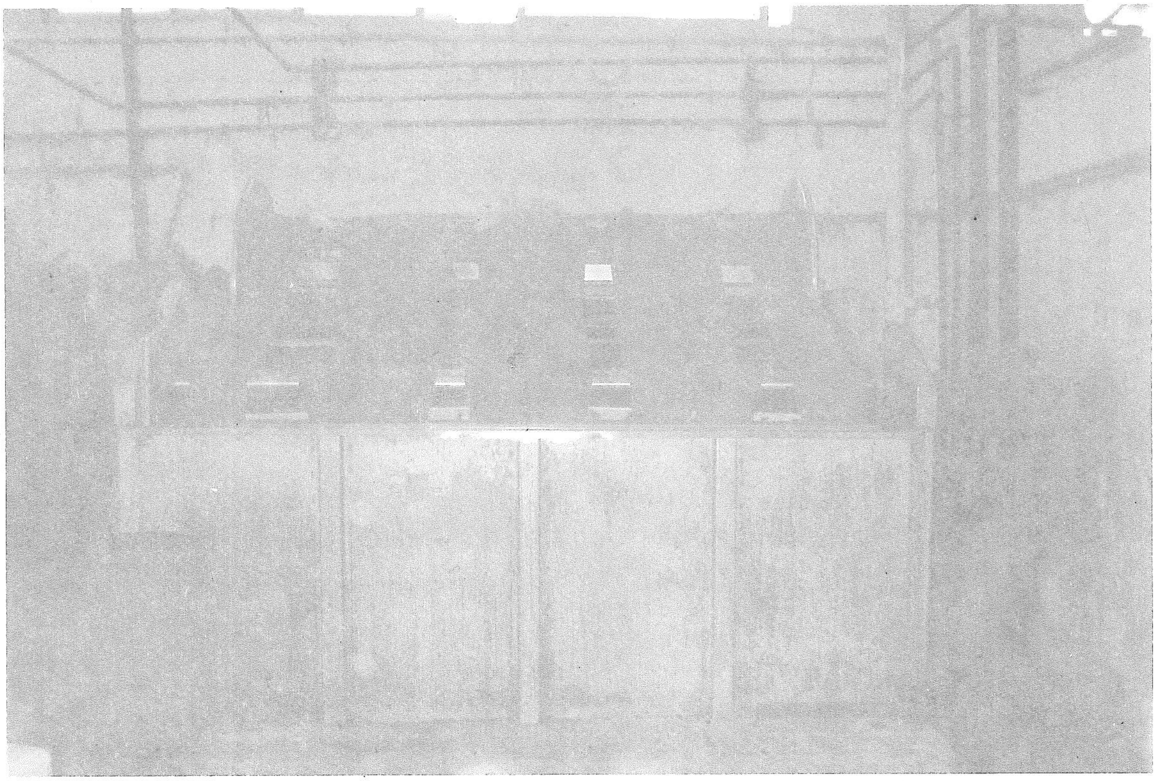
Bobbing



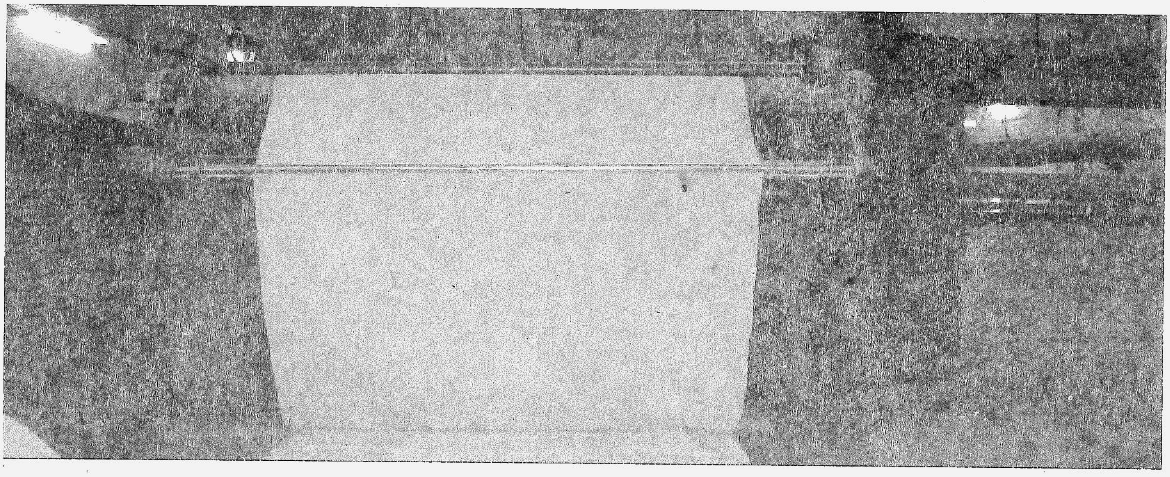
Weaving



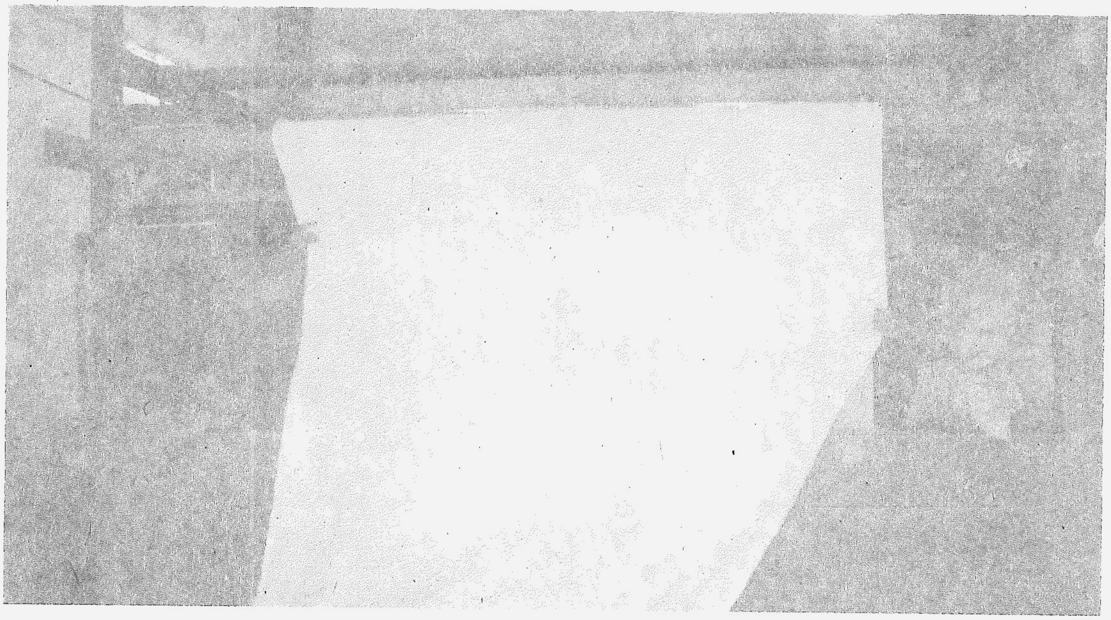
Bleaching



Dyıng



Shearing at grey stage



Shearing / Polishing after bleaching

7.3 General Types/Categories Of Towels

Towels can be defined in 4 types (i) Plain White Towel (ii) Plain Dyed Towel (iii) Plain white Jacquard Towel (iv) Partly dyed Jacquard towel. The towels can also be as per their use i.e. face towel, hand towel, bath towel, beach towel etc.

7.4 Categories Of Raw Material Used

In the manufacturing of terry towels following raw materials are used;

i. Basic raw materials are cotton / blended / pc yarn of different counts.e.g. 10/s, 20/s, 16/s, 30/s etc.
ii. Starch / PVA are used for sizing.
iii. Chemicals used for bleaching & dyeing are Soap, Caustic soda, Hydrogen peroxide, Antioxidant, Hypochlorite, Soda Ash, Acetic Acid, Optical brightner and Softener. In addition for dyeing of towels we require dyes, Sequestering Agent, Soda Ash, Acetic Acid, Salt & Softener.

7.5 Average Conversion Charges Of General Types Of Towels

It is difficult to determine conversion charges of different types of towels as it depend upon their quality. However, normally for medium size & medium weight towel, conversion charges ranges from Rs.3 per Kg to Rs.8 per Kg.

7.6 Input / Output Ratio

Table 7.1

Description	Yarn (Kg) input	Fabrics (Kg) Output	Loss (Kg)
White / Dyed Towel	100	80	20

Note: If shearing process is used, add further wastage of 14%.

7.7 Element Of Value Addition At Each Stage

7.7.1 Bleached Towel

Table 7.2

S.No.	Description	Value addition (100 Kg)	%age value addition
1	Cost of Yarn	7,500	
2	Cost of grey towelling	9,750	30%

	fabrics+wastages		
3	Cost of bleach towelling fabrics+wastage	11,700	20%
4	Cutting , Stitiching & Packing	12,300	05%

7.7.2 Dyed Towel

Table 7.3

S.No.	Description	Value addition (100 Kg)	%age value addition
1	Cost of Yarn	7,500	
2	Cost of grey towelling fabrics+wastages	9,750	30%
3	Cost of Bleach towelling fabrics+wastage	11,200	15%
4	Cost of Dyed towelling fabrics+wastage	12,900	15%
5	Cutting , Stitiching & Packing	13,600	05%

7.7.3 Sheared Towel Bleached

Table 7.4

S.No.	Description	Value addition (100 Kg)	%age value addition
1	Cost of Yarn	7,500	
2	Cost of grey toweling fabrics+wastages	9,750	30%
3	Cost of Bleach towelling fabrics+wastage	11,700	20%
4	Cost of Shearing	15,200	30%
4	Cutting , Stitiching & Packing	16,000	05%

7.7.4 Sheared Towel Dyed

Table 7.5

S.No.	Description	Value addition (100 Kg)	%age value addition
1	Cost of Yarn	7,500	
2	Cost of grey toweling fabrics+wastages	9,750	30%
3	Cost of Bleach toweling fabrics+wastage	11,200	15%
4	Cost of Dyed toweling fabrics+wastage	12,900	15%
4	Cost of Shearing	16,800	30%
4	Cutting , Stitiching & Packing	17,700	05%

7.8 Stage-wise Wastage

Table 7.6

S.No.	Process Description	Wastage invisible	Wastage Visible
1	Yarn Warping / Sizing	1.50%	-
2	Yarn Twisting / Doubling	1.00%	-
3	Weaving	3.00%	-
4	Bleaching / Dying	8.50%	-
5	Stitching	-	3.00%
6	Cutting	-	3.00%
	TOTAL	**14.00%**	**6.00%**

Notes:

- **If** shearing process is used, add another 14% wastage.
- B grade is 15% - 30% of A grade.
- Wastage of cutting is used for preparation of rags etc.
- Weaving waste is sold at 50% of the cost.
- Small pieces of waste are sold between Rs.10 – 15/kg while large pieces are sold for Rs. 35 – 40/kg.

7.9 Relationship Of Energy (Electricity Or Gas) With Production

Table 7.7

S.No.	Description	Cost of Electricity	Cost of Gas
1	Warping/Doubling/Weaving	Rs.5 / Kg(1.55 kwh/kg)	Nil
2	Bleaching/Dyeing	Rs.1/ Kg(0.40 kwh/kg)	Rs.1.5/Kg (4.69 M^3/kg
3	Shearing	Rs.1/Kg(0.12kwh/kg)	Nil

7.10 Issues Relating to Sales Tax

7.10.1 Non Registration

The looms, which are producing the canvas and allied products, and are concentrated in Kasur are also producing towel. All these units are unregistered. It is estimated that about 40000 looms are installed in three different areas of Kasur.

7.10.2 Incomplete Declaration

The invoices of towels sometimes do not contain the particulars of yarn count and construction of the towel fabric, which may indicate use of flying invoices of yarn.

7.10.3 Undue Input Tax on Yarn

Certain units claim input tax adjustment / refund on finer count yarn, i.e. greater than 40 count. This is contrary to the normal usage of yarn in this industry and as such is detrimental to sales tax revenue.

7.10.4 Input on Chemicals

The input tax on chemicals claimed to be used in the process may not be correct. There are chances that input tax on chemicals might be claimed which are not used in this industry or if used the quantity shown may be higher.

7.10.5 Use of Flying Invoices

The units having the dying facility might not have the gas connection. Such units are using furnace oil. It is very difficult to establish some relationship of consumption and production. This may result in undisclosed commercial dying and loss of revenue or use of flying invoices of dyes and chemicals to claim undue input tax adjustment / refund.

7.11 Audit Guide Lines

7.11.1 Wastage Allowance

The wastages allowance will vary from unit to unit. A composite unit can claim all the wastages but a semi composite unit or units having anyone of the processes should not be entitled for all of the wastage allowance.

7.11.2 Usage of Fine Count Yarn

If any unit shows the usage of yarn counts over and above the 40 count, it should be investigated. Costing in such cases may be done to ensure that the cost of raw materials, labour charges and overheads does not exceed the selling price of towels.

7.11.3 Genuineness of Export

The gross weight exported should be compared with the number and size of containers included in the export shipment. The maximum weight that can be carried by 40 feet container is 26 tons and 20 feet is 16 tons. In case the weight of towels in a shipment increase abnormally from this range, the genuineness of export documents needs to be checked.

7.11.4 Local Sale of Wastage

Normally left over pieces of towel fabric are used for the manufacture of bags, rags etc. and supplied in the local market without payment of Sales Tax.

TOWEL MANUFACTURING

Summary of Important Information

Description	Yarn (Kg) input	Fabrics (Kg) Output	Loss (Kg)
White / Dyed Towel	100	80	20

Note: If shearing process is used, add further wastage of 14%.

Element of Value Addition at Each Stage

Bleached Towel

S.No.	Description	Value addition (100 Kg)	%age value addition
1	Cost of Yarn	7,500	
2	Cost of grey towelling fabrics+wastages	9,750	30%
3	Cost of bleach towelling fabrics+wastage	11,700	20%
4	Cutting , Stitiching & Packing	12,300	05%

Dyed Towel

S.No.	Description	Value addition (100 Kg)	%age value addition
1	Cost of Yarn	7,500	
2	Cost of grey towelling fabrics+wastages	9,750	30%
3	Cost of Bleach towelling fabrics+wastage	11,200	15%
4	Cost of Dyed towelling fabrics+wastage	12,900	15%
5	Cutting , Stitiching & Packing	13,600	05%

Stage-wise Wastages

S.No.	Process Description	Wastage invisible	Wastage Visible
1	Yarn Warping / Sizing	1.50%	-
2	Yarn Twisting / Doubling	1.00%	-
3	Weaving	3.00%	-
4	Bleaching / Dying	8.50%	-
5	Stitching	-	3.00%
6	Cutting	-	3.00%
	TOTAL	**14.00%**	**6.00%**

Notes:

- If shearing process is used, add another 14% wastage.
- B grade is 15% - 30% of A grade.
- Wastage of cutting is used for preparation of rags etc.
- Weaving waste is sold at 50% of the cost.
- Small pieces of waste are sold between Rs.10 – 15/kg while large pieces are sold for Rs. 35 – 40/kg.

Relationship of Energy (Electricity or Gas) With Production

S.No.	Description	Cost of Electricity	Cost of Gas
1	Warping/Doubling/Weaving	Rs.5 / Kg(1.55 kwh/kg)	Nil
2	Bleaching/Dyeing	Rs.1/ Kg(0.40 kwh/kg)	Rs.1.5/Kg (4.69 M^3/kg
3	Shearing	Rs.1/Kg(0.12kwh/kg)	Nil

IMPORTANT DATA RELATING TO TEXTILE INDUSTRY

Table A-1

Cotton Arrival in Factories of Pakistan As on 1st June, 2002 (2001-2002 Season)

					Number of Bales Sold To							DIFFERENCE FROM LAST YEARS'		
	Name of District	Arrival in Bales	Pressing in Bales	Weight (Kg) of Pressed B/S	T.C.P	Exporters	Textiles	Total B/S Sold	Stock of Unsold B/S	Stock of Unginned B/S	Arrival as on 01.05.01	Arrival in Bales and in (%)		
1	Multan	520,747	520,528	87,339,393	5,500	3,858	484,352	493,710	26,818	219	428,058	92,689	INCREASE	21.65%
2	Lodhran	497,396	497,396	79,583,360	4,400	100	472,764	477,264	20,132	0	371,507	125,889	INCREASE	33.89%
3	Khanewal	405,838	405,538	61,163,241	300	7,450	363,184	370,934	34,604	300	415,655	-9,817	(SHORT)	-2.36%
4	Muzaffargarh	472,973	472,653	77,992,472	7,200	0	444,686	451,886	20,767	320	465,974	6,999	INCREASE	1.50%
5	Dera Ghazi Khan	448,427	448,427	72,286,432	2,600	3,400	435,332	441,332	7,095	0	498,364	-49,937	(SHORT)	-10.02%
6	Rajanpur	583,975	583,975	95,655,105	7,700	14,000	552,587	574,287	9,688	0	532,575	51,400	INCREASE	9.65%
7	Leiah	52,467	52,467	8,199,018	2,,500	300	43,710	46,510	5,957	550	50,454	2,013	INCREASE	3.99%
8	Vehari	533,811	533,261	85,251,553	5,600	5,366	436,486	447,452	85,809	250	672,035	-138,224	(SHORT)	-20.57%
9	Sahiwal	312,537	312,287	53,041,947	6,500	7,000	287,987	301,487	10,800	300	353,083	-40,546	(SHORT)	-11.48%
10	Pakpattan	131,398	131,098	21,948,427	1,200	0	124,592	125,792	5,306	0	126,443	4,955	INCREASE	3.92%
11	Okara	44,830	44,830	7,461,954	0	200	41,914	42,114	2,716	200	60,813	-15,983	(SHORT)	-26.28%
12	Qasur	19,600	19,400	3,128,832	0	0	19,300	19,300	100	0	13,043	6,557	INCREASE	50.27%
13	T.T.Singh	208,223	208,223	34,242,272	0	0	202,277	202,277	5,946	200	231,544	-23,321	(SHORT)	-10.07%
14	Faisalabad	125,849	125,649	20,696,903	0	0	119,705	119,705	5,944	0	158,867	-33,018	(SHORT)	-20.78%
15	Jhang	165,768	165,768	27,698,175	0	0	161,077	161,077	4,691	0	151,937	13,831	INCREASE	9.10%
16	Mianwali	6,979	6,979	1,166,540	0	0	6,195	6,195	784	0	6,662	317	INCREASE	4.76%
17	Bhakkar	28,390	28,390	4,742,266	0	0	25,275	25,275	3,115	0	35,621	-7,231	(SHORT)	-20.30%
18	Rahim Yar Khan	1,291,624	1,291,624	218,861,249	42,800	5,208	1,154,386	1,202,394	89,230	0	1,304,152	-12,528	(SHORT)	-0.96%
19	Bahawalpur	1,344,027	1,343,390	223,498,921	21,400	12,202	1,221,062	1,254,664	88,726	637	1,380,825	-36,798	(SHORT)	-2.66%
20	Bahawalnagar	764,374	762,974	125,890,000	33,200	26,369	684,622	744,191	18,783	1,400	751,221	13,153	INCREASE	1.75%
	Total of Punjab	7,959,233	7,954,857	1,309,848,060	140,900	85,453	7,281,493	7,507,846	447,011	4,376	8,008,833	-49,600	(SHORT)	-0.62%
	As On 1st. May, 2001	8,008,833	8,002,001	0	200	351,429	7,250,710	7,602,339	399,662	6,832	7,598,004	410,829	INCREASE	5.41%
1	Hyderabad	171,864	171,864	28,139,116	3,200	519	151,449	155,168	16,696	0	196,074	-24,210	(SHORT)	-12.35%
2	Tharparkar	146,855	146,549	23,503,931	21,801	1,445	118,141	141,387	5,162	306	144,964	1,891	INCREASE	1.30%
3	Sanghar	566,970	566,270	91,351,179	32,100	12,968	481,015	526,083	40,187	700	715,196	-148,226	(SHORT)	-20.73%
4	Nawabshah	257,551	257,551	43,087,518	3,400	0	238,598	241,998	15,553	0	240,892	16,659	INCREASE	6.92%
5	Naushero Feroz	197,157	197,157	34,027,280	9,800	1,645	179,912	191,357	5,800	0	148,683	48,474	INCREASE	32.60%
6	Khairpur	176,026	176,026	29,753,415	12,000	3,200	155,781	170,981	5,045	0	122,088	53,938	INCREASE	44.18%
7	Ghotki	560,371	560,371	95,263,070	16,100	0	512,631	528,731	31,640	0	401,208	159,163	INCREASE	39.67%
8	Sukkar	217,928	217,928	37,023,196	3,600	12	185,270	188,882	29,046	0	171,985	45,943	INCREASE	26.71%
9	Dadu	56,511	56,511	9,325,523	500	0	52,695	53,195	3,316	0	37,463	19,048	INCREASE	50.84%
10	Dessi	3,779	3,779	642,430	2,061	1,600	0	3,661	118	0	0	3,779	INCREASE	
	Total of Sindh	2,355,012	2,354,006	392,116,658	104,562	21,389	2,075,492	2,201,443	152,563	1,006	2,178,553	176,459	INCREASE	8.10%
	As On 1st May 2001	2,178,553	2,175,588	0	10,700	220,334	1,699,864	1,930,898	244,690	2,965	2,147,443	31,110	INCREASE	1.45%
	Total of Pakistan	10,314,245	10,308,863	1,701,964,718	245,462	106,842	9,356,985	9,709,289	599,574	5,382	10,10,187,386	126,859	INCREASE	1.25%
	As On 1st. May, 2001	10,187,386	10,177,589	0	10,900	571,763	8,950,574	9,533,237	644,352	9,797				

Source: Pakistan Cotton Ginners Associaiton.

Spot Rate of Sawgin Cotton
(excluding Sale Tax)
(Rs. Per Maund of 37.32 Kgs)

1995-96 Crop

	Niab-78	K-68	MNH-93
Average :	1980.32	2155.6	2169.02

1996-97 Crop

	Niab-78	K-68	MNH-93
Average :	2369.17	2511.64	2501.17

1997-98 Crop

	Niab-78	K-68	MNH-93
Average	2,133.79	1,902.84	1,923.41

1998-99 Crop

	Niab-78	K-68	MNH-93
Average	227.63	2348.99	2388.41

1999-00 Crop

	Niab-78	K-68	MNH-93
Average	1,675.55	1,461.25	1,671.26

2000-01 Crop

	Rs. Per Maund
Average	2223

Source : APTMA

Table A-3

Export Of Cotton & Cotton Manufactures

(Million US$)

Cotton Manufactures													COTTON & COTTON WASTE						
													% OF TOTAL EXPORT					% OF TOTAL EXPORT	
PERIOD	COTTON YARN	COTTON CLOTH	TENT & CANVAS	COTTON BAGS	TOWELS	BED WEAR	OTHER MADE-UPS	GARMENTS	HOSIERY	THREAD	COTTON MANUFACTURE	TOTAL EXPORT	COTTON MANUFAC TURE	COTTON YARN	COTTON CLOTH	COTTON	COTTON WASTE	COTTON	COTTON WASTE
1998-99	945.2	1115.2	40.8	20.8	177.7	611	255.3	651.2	742.1	1.5	4560.8	7779.3	58.6	12.2	14.3	2.3	28.1	0	0.4
1999-00	1071.6	1096.2	52.9	19.2	195.6	709.9	307.6	771.7	886.7	1.3	5112.7	8568.6	59.7	12.5	12.8	72.6	36.4	0.8	0.4
2000-01	1076.6	1035 .0	50. 0	19. 0	243. 0	734.9	328.2	827.5	910.3	1. 0	5225.5	9224.7	56.6	11.7	11.2	138.1	39. 0	1.5	0.4

Source : APTMA

Table A-4

Consumption Of Cotton And Fibre

Fig in '000' Kgs

Period	Raw Materials			Growth%		% of Total	
	Cotton	Fibre	Total	Cotton	Fibre	Cotton	Fibre
1998-99	1,441,923	407,686	1,849,609	-2	28	78	22
1999-00	1,566,348	404,008	1,970,356	9	-1	79	21
2000-01	1,673,280	405,038	2,078,318	7	0	81	19

Source : **APTMA**

Table A-5

Production Of Yarn: Province-Wise

Fig. in '000' Kgs

PERIOD	PUNJAB	SINDH	N.W.F.P	BALUCHISTAN	TOTAL	GROWTH %
1998-99	1,107,240	333,622	70,588	36,182	1,547,632	0.45
1999-00	1,194,377	367,173	81,950	35,036	1,678,536	8.46
2000-01	1,239,358	365,029	87,133	37,609	1,729,129	3.01

Source : **APTMA**

Table A-6

Growth Of Textile Industry In Pakistan: Province - Wise

Period				SINDH INSTALLED Units Spindle Rotors Looms 000				BALUCHISTAN INSTALLED Units Spindle Rotors Looms 000	PUNJAB INSTALLED Units Spindle Rotors Looms 000				A. KASHMIR INSTALLED Units Spindle 000		N.W.F.P. INSTALLED Units Spindle Rotors Looms 000				TOTAL PAKISTAN INSTALLED Units Spindle Rotors Looms 000			
1986-87	103	1,792	26,842	7,001	6	100	5,376	2,328	101	2,157	15,976	7,097	4	63	12	244	0	1,045	226	4,356	48,194	17,471
1987-88	101	1,806	30,848	6,050	8	112	6,816	2,328	102	2,186	17,696	7,607	4	63	9	226	0	384	224	4,393	55,360	16,369
1988-89	107	1,851	35,072	6,678	10	112	9,480	2,300	117	2,592	21,856	7,315	4	63	9	235	0	360	247	4,853	66,408	16,653
1989-90	109	1,908	38,604	5,596	11	129	9,432	2,300	132	2,919	23,992	7,252	5	75	9	240	0	436	266	5,271	72,028	15,584
1990-91	110	1,910	38,820	5,189	11	129	9,840	2,300	142	3,210	25,862	7,278	5	75	9	244	0	546	277	5,568	74,522	15,313
1991-92	111	1,948	40,988	5,131	11	129	10,240	2,300	171	2,806	29,792	6,925	5	75	9	258	0	454	307	5,216	81,020	14,810
1992-93	112	2,053	44,444	4,694	11	129	12,808	2,300	195	4,245	37,036	6,587	6	92	10	341	400	454	334	6,860	94,688	14,035
1993-94	124	2,084	55,644	4,942	12	151	15,688	2,300	271	5,513	64,524	5,864	6	94	16	434	400	454	429	8,276	136,256	13,560
1994-95	125	2,080	55,980	5,746	12	151	14,536	2,300	286	5,627	59,488	5,557	6	94	17	449	400	454	446	8,401	130,404	14,057
1995-96	128	2,128	59,420	4,815	13	166	15,688	2,300	297	5,740	66,472	5,761	6	94	17	459	0	442	461	8,587	141,580	13,318
1996-97	114	1,948	57,236	4,626	10	70	14,592	100	293	5,654	71,632	4,769	6	94	17	464	0	442	440	8,230	143,460	9,937
1997-98	114	1,958	58,632	4,167	10	70	14,592	100	295	5,749	76,412	5,055	6	94	17	497	0	442	442	8,368	149,636	9,764
1998-99	114	1,982	58,968	4,158	10	70	13,632	100	295	5,715	93,765	5,176	6	94	17	531	0	442	442	8,392	166,365	9,876
1999-00	114	1,997	58,200	4,200	10	70	14,400	100	296	5,775	77,180	5,202	6	94	17	541	0	442	443	8,477	149,780	9,944
2000-01	114	1,991	56,576	4,356	10	83	14,592	100	297	5,858	74,360	5,083	6	94	17	574	0	442	444	8,600	145,528	9981

Source : **APTMA**

Table A-7

Production Of Yarn: Province-Wise

Fig. in '000' Kgs

PERIOD	PUNJAB	SINDH	N.W.F.P	LUCHIST	TOTAL	GROWTH %
1998-99	1,107,240	333,622	70,588	36,182	1,547,632	0.45
1999-00	1,194,377	367,173	81,950	35,036	1,678,536	8.46
2000-01	1,239,358	365,029	87,133	37,609	1,729,129	3.01

Table A-8

Province-Wise Number Of Mills

	SINDH			PUNJAB		
	WORKING	CLOSED	TOTAL	WORKING	CLOSED	TOTAL
COMPOSITE	14	6	20	25	2	27
SPINNING	55	39	94	235	36	271
TOTAL	69	45	114	260	38	298

	N.W.F.P.			BALUCHISTAN		
	WORKING	CLOSED	TOTAL	WORKING	CLOSED	TOTAL
COMPOSITE	2	0	2	1	0	1
SPINNING	14	1	15	7	2	9
TOTAL	16	1	17	8	2	10

	TOTAL PAKISTAN			AZAD KASHMIR		
	WORKING	CLOSED	TOTAL	WORKING	CLOSED	TOTAL
COMPOSITE	42	8	50	0	0	0
SPINNING	311	78	389	5	1	6
TOTAL	353	86	439	5	1	6

	GRAND TOTAL		
	WORKING	CLOSED	TOTAL
COMPOSITE	42	8	50
SPINNING	316	79	395
TOTAL	358	87	445

Source : Textile Commissioner's Organization

Table A-9

Production Of Yarn Category-Wise (Metric Tons)

PERIOD	UNITS	COUNT					BLEND YARN		FROM CBR REPORT		GRAND TOTAL
		COARSE	MEDIUM	FINE	S. FINE	WASTE	P/V	P/C	COTTON	BLENDED	
1998-99	442	707,723	368,424	35,969	18,437	22,478	117,452	277,149	N.A	N.A	1,547,632
1999-00	443	806,556	382,330	36,014	19,126	32,069	129,229	273,212	N.A	N.A	1,678,536
2000-01	444	832,400	410,910	37,892	20,204	34,222	112,289	281,212	NA	NA	1,729,129

Source : **APTMA**

TABLE A-10

(Mill Sector)

Month-Wise Production of Cloth (In OOO Sq.Mtr) Category Wise

MONTH	GREY	BLEACHED	DYED	PRINTED	BLENDED	G.TOTAL
JUL.00	23424	1536	5851	3752	5086	39649
AUG.00	23321	1889	6798	4420	6032	42460
SEP.00	23473	2068	6276	3182	6671	41670
OCT.00	23868	1543	5826	2661	5670	39568
NOV.00	23203	1554	6629	1885	5672	38943
DEC.00	23127	1737	5970	3009	5269	39112
JAN.01	22115	2113	6356	1711	6217	38512
FEB.01	21345	2168	6088	2270	5539	37410
MAR.01	22126	1020	7677	4388	5500	40711
APR.01	23449	1472	7329	7152	4903	44305
MAY.01	23791	1707	8202	5445	5532	44677
JUN.01	24689	1132	5784	6159	5383	43147
TOTAL	277931	19939	78786	46034	67474	490164

Source : **Textile Commissioner's Organization**

Table A-11

Production Of Yarn Count-Wise (Metric Tons)

Years	1998-99	1999-00	2000-01
Mills	442	443	444
Coarse-count			
1-9s	52,855	59,942	68,935
10s	105,349	110,392	99,077
12s	34,666	38,340	41,485
14s	25,981	35,519	35,547
16s	149,829	151,060	167,358
18s	34,403	46,860	40,713
20s	304,640	364,443	379,285
Sub-Total	***707,723***	***806,556***	***832,400***
Medium-Count			
21s	83,940	75,082	74,843
24s	60,667	64,039	66,981
28s	32,996	32,016	40,929
30s	145,238	158,274	166,427
32s	33,937	32,303	42,906
34s	11,646	20,616	18,824
Sub-Total	***368,424***	***328,330***	***410,910***
Fine Count			
36s	14,195	9,953	10,089
40s	18,603	22,885	24,261
47s	3,171	3,476	3,542
Sub-Total	***35,969***	***36,014***	***37,892***
S. Fine Count			
48s	5,118	4,292	5,067
60s	5,192	4,050	3,557
80s	8,127	10,784	11,580
Sub-Total	***18,437***	***19,126***	***20,204***
Poly/Viscose	117,452	129,229	112,289
Poly/Cotton	277,149	273,212	281,212
Sub-Total	***394,601***	***402,443***	***393,501***
Mixed & HArd			
Waste	22,478	32,069	34,222
Sub-Total	***1,547,632***	***1,678,536***	***1,729,129***
Grand-Total	**1,547,632**	**1,678,536**	**1,729,129**

Source : APTMA

Table A-12

Production Of Yarn Count-Wise With Percentage

(Metric Tons)

Counts	1998-1999		1999-2000		2000-2001	
Coarse	Quantity	%Age	Quantity	%Age	Quantity	%Age
1-9s	52855	3.42	59942	3.57	68935	3.99
10s	105349	6.81	110392	6.58	99077	5.73
12s	34666	2.24	38340	2.28	41485	2.4
14s	25981	1.68	35519	2.12	35547	2.06
16s	149829	9.68	151060	9. 00	167358	9.68
18s	34403	2.22	46860	2.79	40713	2.35
20s	304640	19.68	3644430	21.71	379286	21.94
Sub-Total	***707723***	***45.73***	***806556***	***48.05***	***832401***	***48.14***
Medium						
21s	83940	5.42	75.82	4.47	74843	4.33
24s	60667	3.92	64.39	3.82	66981	3.87
28s	32996	2.13	32016	1.91	40929	2.37
30s	145238	9.38	158274	9.43	166427	9.62
34s	11646	0.75	20616	1.23	18824	1.09
Sub-Total	***368424***	***23.81***	***382880***	***22.78***	***410910***	***23.76***
Fine						
36s	14195	0.92	9953	0.59	10089	0.58
40s	18603	1.2	22585	1.35	24261	1.4 0
47s	3171	0 .20	3476	0 .21	3542	0 .20
Sub-Total	***35969***	***2.32***	***36014***	***2.15***	***37892***	***2.19***
S.Fine						
48s	5118	0 .33	4292	0 .26	5067	0 .29
60s	5192	0 .34	4050	0 .24	3557	0 .21
Sub-Total	***18437***	***1.19***	***19126***	***1.14***	***20204***	***1.17***
COTTON	1130553	73.05	1244026	74.11	1301407	75.26
P.Viscose	117452	7.59	129229	7.7 0	112289	6.49
P.Cotton	277149	17.91	273212	16.28	281212	16.26
Sub-Total	394601	25.5 0	402441	23.98	393501	22.76
Waste	22478	1.45	32069	1.91	34222	1.98
G.Total	**1547632**	**100. 00**	**1678536**	**100. 00**	**1729130**	**100. 00**

Source : **APTMA**

Table A-13

Month Wise Average Price Of Yarn (Faisalabad Market)

Rupees Per 4.54 Kgs. (10 lb)

Month	10s	20s	30s	40s	80s
JUL.00	264.46	448.23	605.76	742.63	1419.43
AUG.00	279.75	466.58	586.77	767.58	1490.75
SEP.00	282.84	462.08	574.42	744.79	1611.59
OCT.00	286.91	459.16	577.76	731.9 0	1645.4 0
NOV.00	312.6	481.49	588.83	755.06	1790.74
DEC.00	323.19	484.24	618.39	774.83	1756.89
JAN.01	320.86	480.45	611.49	772.86	1719.04
FEB.01	325.03	479.23	596.28	751.71	1679.4 0
MAR.01	339.38	491.73	607.5 0	765.52	1709.86
APR.01	337.1 0	500.62	622.6 0	753.33	1622.9 0
MAY.01	329.36	496.15	634.45	759.22	1624.13
JUN.01	334.7 0	493.05	615.81	741.14	1513.69

Source : **APTMA**

Table A-14

Local Market Price Of Man-Made Staple Fibre At Karachi

RS. PER KG

Year 2001

Month	Poly Staple Fiber		Viscose Staple Fibre
	Local	Imported	Imported
Jan	71.00	71.00	114.00
Feb	67.90	68.00	113.50
Mar	70.40	70.00	111.50
Apr	71.40	71.00	110.80
May	71.40	71.00	110.80
Jun	73.00	73.00	112.00
Jul	71.90	73.00	116.40
Aug	73.00	73.50	116.60

Source : **APTMA**

Table A-15

Production, Exports & Domestic Requirement Of Yarn

Fig in '000' Kgs

PERIOD	PRODUCTION	CONSUMED IN MILL SECTOR		EXPORTS		AVAILABLE FOR LOCAL MARKET	
		QUANTITY	% OF PROD.	QUANTITY	% OF PROD.	QUANTITY	% OF PROD.
1998-99	1,547,632	55,947	3.62	421,481	27.23	1,070,204	69.15
1999-00	1,678,536	65,481	3.9	512,971	30.56	1,100,084	65.54
2000-01	1,729,129	68,275	3.95	545,134	31.59	1,115,720	64.52

Source : **APTMA**

TABLE A-16

PRODUCTION EXPORTS & DOMESTIC REQUIREMENT OF CLOTH

(Qty in million Sq. Meters

PERIOD	MILL SECTOR	NON-MILL SECTOR	TOTAL PRODUCTION	EXPORTS		AVAILABLE FOR LOCAL MARKET	
				QUANTITY	% OF PROD.	QUANTITY	% OF PROD.
1998-99	384.56	4002.23	4386.79	1355.17	30.89	3031.62	69.11
1999-00	437.19	4549.97	4987.16	1574.88	31.58	3412.28	68.42
2000-01	490.16	5101.24	5591.40	1736.00	31.05	3855.40	68.95

Source : **APTMA**

Table A-17

Month Wise Consumption Of Yarn & Production Of Cloth

MONTH	CONSUMPTION OF YARN	PRODUCTION OF CLOTH		
	(000 Kgs)	(000 Sq.Meter)		
		COTTON	*BLENDED*	*TOTAL*
JUL.00	5798	34563	5086	39649
AUG.00	5736	36428	6032	42460
SEP.00	5731	34999	6671	41670
OCT.00	5536	33898	5670	39568
NOV.00	5601	33271	5672	38943
DEC.00	5554	33843	5269	39112
JAN.01	5768	32295	6217	38512
FEB.01	5386	31871	5539	37410
MAR.01	5509	35211	5500	40711
APR.01	5515	39402	4903	44305
MAY.01	5863	39145	5532	44677
JUN.01	6278	37764	5383	43147
TOTAL	**68275**	**422690**	**67474**	**490164**

Source : **Textile Commissioner's Organization**

Table A-18

Exchange Rate Of Major Countries In Pak Rupees

COUNTRY	U.S.A	U.K.	ITALY	FRANCE	GERMANY	BELGIUM
Name of Currency:	US$ Rs.	Pound Stg. Rs.	Lira Rs.	F.Franc Rs	D.M. Rs.	Franc Rs.
1998 YEAR AVERAGE	46.7060	77.2290	0.0295	7.9064	26.6173	1.3164
1999 YEAR AVERAGE	50.7207	81.9922	0.0278	8.8166	27.5750	1.3401
2000 YEAR AVERAGE	53.5124	81.0303	0.0300	7.4918	25.3274	1.2199
2001 YEAR AVERAGE	60.5672	87.1457	0.0280	8.2864	27.9586	1.3489

COUNTRY	HOLLAND	JAPAN	HONGKONG	AUSTRALIA	SINGAPORE
Name of Currency:	Guilder Rs.	Yen Rs.	Hk$ Rs.	Aust.$ Rs	Dollar Rs.
1998 YEAR AVERAGE	23.5511	0.3572	6.1758	29.2812	27.9548
1999 YEAR AVERAGE	24.5364	0.4435	6.5271	32.5886	29.8615
2000 YEAR AVERAGE	22.4001	0.0496	6.8677	30.9898	31.2697
2001 YEAR AVERAGE	24.6946	0.5024	7.7571	31.6474	33.9879

Source : APTMA

APPENDIX-II
Textile Terms and Definitions

Acid Dye — An anionic dye applied from an acidic or neutral dye bath, it has affinity for fibres containing basic groups. It is used for dyeing woolen fabric.

Acrylic Fibre — A man made fibre containing nit rile. Maturing or ripening of alkali cellulose. Steaming of printed fabrics.

Aging — Maturing or ripening of alkali cellulose. Steaming of printed fabrics.

Angora Fabric — Fabric woven of angora yarn

Angora Yarn — A soft yarn in which the constituent fibres are hair of angora rabbit or goat.

Armure — Embossing effect used to give a pattern e.g.in drapery or upholstery.

Armure Fabric — A fabric that is woven in armure weave.

Armure Weave — The weave designed to produce armure effect. It has definite pattern. Figure on the surface.

Azoic Dyes — These are cold 'dyes' containing the –azo-group. These are mostly used in batic work

Ageing — Originally, in process in which printed fabric was exposed to a hot, moist atmosphere. At the present time, the term is almost exclusively applied to the treatment of printed fabric in moist steam in the absence of air.Ageing is also used for the development of certain colours in dyeing, for example, aniline black.

Ager — A chamber used for ageing

Anti-static agent — A substance capable of preventing, reducing, or dissipating electrical charges that might otherwise be produced.

Bagheera Term used for uncut dyed velvet cloth to be used for gowns

Basic Dyes Dyes containing basic amino group and applied to natural cellulosic fibres in an alkaline dye bath.

Bath The basic solution in which a chemical process is carried out.

Batik This is a traditional Indian method of producing discreet patterns/ designs on to the fabric with the help of wax/or gum resist and cold dyes.

Blanket A heavy fabric having raised finish

Blazer Cloth This cloth has wool in both warp and weft used for apparels in either single or stripes colouring. It may be given a milling or raising finish.

Bleaching Chemical process of improving the whiteness of the fabrics, yarn or fibre with/without removal of natural colours, e.g. hydrogen peroxide.

Bleading It is the phenomenon loss of colour from a dyed fabric or materialon coming in contact with a solvent. It leads to the decolouration of the dyed material.

Blending Mixing of different fibres in definite proportion to get an end product having the cumulative advantages of its constituents e.g cotton polyester blends.

Blinding Removal of lustre of textiles.

Blind Stitch A sewing stitch not visible on the face of a fabric or garment

Bobbin Finings — A lace construction in which treads from the brass-bobbin provide the filing in of the objects.

Boucle Yarn — A yarn having tight loops formed across its length.

Brighteners — These are chemical constituents added into detergents and washing powders to increase the whiteness of the material.

Brocade — A fabric having intricate figuring effect by using satin or sateen weaves on a plain weave background extensively used for silk sarees.

Brocade Cloth — a rib effect wove cloth having high cover factor.

Brushing — Finishing process involving passing of the material over one or more brushes. It gives a raised effect

Breaking Elongation , Breaking Extension — The Elongation (extension) at the breaking load

Breaking Length — The length of a specimen whose weight (i.e. mass subjected to gravity) is equal to the breaking load expressed in grams or pounds

Breaking Load — The load that develops the braking tension. It is correctly expressed in newtons.

Breaking Stress — The maximum stress developed in a specimen stretched to rupture. The force is usually related to the area of the unstrained specimen's if the actual stress, defined in terms of the area of the strained specimen, is used, then its maximum value is called the actual breaking stress.

Breaking Tension — The maximum tension developed in a specimen stretched to rupture. It is correctly expressed in newtions.

Beam — A cylinder (usually) of wood or metal) provided with end bearing and at each end of which may be mounted suitable flanges.

Beam (lace machines)

- (Furnishing) A subsidiary warp of parallel threads, wound in sheet form onto a beam to provide one set of threads in a net ground.
- (Leavers) Parallel threads wound in sheet form onto a small beam to provide the threads for one steel bar. These threads may be used for pattering and/or netting.
- (Warp)Parallel threads wound in sheet form onto a beam to provide the threads for one steel bar. These threads are used for the structural ground or for pattering.

Beaming The primary operation of warp-making in which ends withdrawn from a warping creel, evenly spaced in sheet are wound onto a beam to substantial length (usually a multiple of loom warp length).

Bow Curvature of the warp or weft in a cloth. The cloth is said to be warp or weft bowed according to which set of threads is curved.

Bright pick, Bright yarn A tight pick usually found in a fabric containing a continuous filament weft

Bowing (Knitting) Curvature of the fabric courses imposed during knitting or subsequent operations.

Backwashing The washing of dyed or undyed wool sliver before or after gilling and/or combing

Batchwise Processing Processing of materials as lots or batches in which the whole of each batch is subjected to one stage of the process at a time.

Beam Dyeing The dyeing of yarn, wound in the form of a warp sheet, or fabric on a perforated beam

Bleached Cotton Linters	Cotton linters that have been purified and bleached ready for subsequent processing. Bleached cotton linters are used in the manufacture of cellulose acetate
Bleaching	The procedure, other than by scouring only, of improving the whiteness of textile material by decolorizing it from the grey state, with or without the removal of natural colouring and or extraneous substances.
Bleaching Agent	A chemical reagent capable of destroying partly or completely the natural colouring matter of textile fibres, yarns, or cloths and leaving them white or considerably lighter in colour. Example are Oxidizing agents such as sodium or calcium hypochlorite, permanganates, sodium chlorite or hydrogen peroxide and reducing agents such as sulphur dioxide or sodium bisulphate
Bleeding	Loss of dye from a coloured material in contact with a liquid leading to coloration of the liquid, or of adjacent areas of the same or other material
Brightness	Converse of dullness
Calendaring	A finishing process to increase the smoothness and lustre of fabric. The material is passed between heated rollers under high pressure.
Calico	A term used for plain weave cotton fabric having medium cover factor.
Cambric	light weight, closely wove cottons/linen fabric which is usually given a slightly stiffening effect.
Canvas	A heavy weight, plain weave fabric of cotton, flax, hemp or jute. It has good strength and firmness.
Cashment Cloth	Light to medium weight faced fabric of natural or man made fibre yarns.

Cashmere	Fine wool procured from Asiatic goat.
Cavalry Twill	A warp-faced fabric having double twill lines sepeerated by grooves. It is a heavy weight fabric.
Chambrav	A light net, plain weave of cotton. Its blends are of synthetic yarns. It may have stripes check or figurings. It is used for children's garments, pyjamas, shirts and sportswear.
Check	A pattern of squares
Chinchilla	A thick, double fabric having a napped surface. It is used for overcoats.
Colour Fastness	The property by virtue of which the dyed material has resistance against bleeding on washed or exposed to light, gas, rubbing
Combing	The yarn whose slivers have been carded and combed.
Composite Yarn	Yarn made of both staple and filament fibres
Cord	A general term used for (a) plied (b) cabled yarns and structures made by braiding, knitting or weaving.
Corduroy	A cut pile having cords or ribs in the warp direction e.g. cut velveteen fabrics.
Count of Cloth	It is the number of picks per inch and ends per inch in the cloth.
Crepe De Chine	A light weight fabric made of alternate S and Z twist. It has a high crinkled effect.
Crepe Fabric	Fabric of highly twisted fabric with crimped effect produced by alternate S and Z twist.
Croche	Continuous series of loops with single needle.

Curing	If is the procedure of setting of resin or plastic.
Carded Yarn	A yarn produced from fibres that have been carded but not combed
Carding	The disentanglement of fibres by working them between two closely spaced, relatively moving surfaces clothed with pointed wire, pins, spikes, or saw teeth.
Carrier (Spinning)	A positively driven, smooth metal roller set between the major drafting rollers on some worsted drawing boxes and spinning frames to control the fibres during drafting.
Cheese	A cylinder package of yarn, cross wound on to a flangeless support
Combed Yarn	Yarn produced from fibres that have been carded (or prepared) and combed
Combing	Straightening and parallelizing fibres and removing short fibres and impurities by using a comb or combs assisted by brushes and rollers, and sometimes knives.
Core Yarn	A yarn produced at the spinning frame by the feeding of yarn through the delivery rollers only, simultaneously with the spinning of staple material.
Count of Yarn; Yarn count; Yarn number; Yarn Linear Density	A number indicting the mass per unit length or the length per unit mass of a yarn.
Creel (General Sense)	A structure for mounting supply packages in textile processing. In yarn processing i) Yarn control during withdrawal from the packages is usually provided.. ii) Yarn withdrawal may be either, a) Over-end from stationary

packages, or

b) Unrolling from revolving packages.

Carrier (Braiding) A moving holder for one yarn package, which moves in a track on a braidius machine

Cockle The wrinted appearance of a fabric in which non-uniform relaxation or shrinkage has occurred.

Count of reed; reed number The number of dents per units width of reed in common use, e.g.,

i) The number of dents per inch.
ii) The number of dents per 2 inch.
iii) The number of groups of 20 dents per 36 inch
iv) The number of groups of 10 cm

The recommended SI unit is dents/cm

Crimp The waviness of a fibre

Calender (1)A machine in which heavy rollers (bowls) rotate in contact under mechanical or hydraulic pressure. The bowls may be un heated, or one may be a thick walled steel shall heated intemally. All bowls may rotate at the same surface speed, or one highly polished and heated bowl may rotate at a higher surface speed than the rest. In certain specialized machines, for knitted goods, two adjacent bowls may be heated, or, in the case of a laundry calendar, one roller works against a steam chest shaped to the curvature of the roller.

(2) To pass fabric through a machine as above, normally to smooth and flatten it to close the intersections between the yarns, or to confer surface glaze. Special calendars with an engraved heated bowls imprint a pattern in relief

or modify the fabric surface to give high luster.

Carrier (Dyeing)	A product added to a dye bath to promote the dyeing of hydrophobic synthetic fibres and characterized by affinity for, and ability to swell, the fibre
Chiorination	When used with reference to textile processing , a term indicating the reaction of a fibre with chlorine.
Coated Fabric	A textile fabric on which there has been formed on one or both surfaces, a layer, or layers, of firmly adherent coating material.
Crease(Fabric Defect)	An unintentional fold in a fabric that may be introduced at some stage in processing .
Crocking	A synonym for 'rubbing' in the sense of the fastness to rubbing of dyes
Curing	The heat treatment of textiles (fibres, yarns, and fabrics, but mainly fabrics) designed to complete the polymerization or condensation reaction of added substance.
Denim	3/1 warp faced, 2c/1d twill weave, heavy cotton cloth. The fabric is made of yarn-dyed warp and undyed weft yarn.
Direct Dyes	Dyes made of vegetable fibres. These are used for dying callulosic & protein fibres. It is easily applied dyed but has low fastness.
Disperse Dyes	Dyes used only for synthetics eg. Polyester. It is used mostly in for cotton fibres.
Discharge (Printing)	A method of printing in which by application of a chemical substance onto specific areas of a dyed fabric the dye is discharged (removed) leaving a white or differently coloured pattern.

Dobby	It is a loom used for making double fabrics. It has healed capacity greater than tappet loom. It also shows greater efficiency. Different colour and weave effects can be woven using drop box motion at the shuttle box.
Dobby Fabric	Fabric having weave or effect requiring a dobby looms eg. Shepherds checks.
Drill	A twil weave, piece dyed fabric. It is usually made in 0.7m width.
Dry-Clean	Process of removing grease, oil and dust from a textile material suing an organic solvent and a white powder. It does not involve usage of water.
Duffle-Duffle	A heavy woollen fabric napped from the face and back. It is used for making duffle coats.
Dupion Fabric	Term for fabric woven from silk ,man made fibre
Dye	A chemical containing chromophore, which on application to another suitable material imparts colour to it accordingly
Denier	The weight in grams of 9000 meters of a filament or yarn. The denier system was commonly used as the standard count for all continuous filament yarns. Yarns spun from man-made staple fibres were usually designated by the count system appropriate to the method of spinning, although the fineness of individual fibres composing the spun yarn was denoted by denier. The recommended system is tex with the unit decitex for filament yarn.
Detergent	A substance that assists the removal of dirt
Elastic Fabric	A fabric composed of fibers/yarns having very high young's modulus. Thus the fabric is characterized by very high extensibility on application of stress without any permanent A deformation eg. Lycra

Embossing	Method of developing a raised/depressed pattern on to the material by passing it between heated roller having the similar design engraved upon one of them. It is generally used upon thermo plastic fabrics.
Embroidery lace	Needle work by hand or machine producing decorative patterns on to the cloth
Fabric	General term used for all materials made of fibres/yarns by weaving, knitting, lace binding, braiding, felting, bonding, fusing or inter locking.
Fastness	Fastness of material to an agent means the resistance of the former towards the latter.
Fibre	A unit of matter characterized by flexibility, fineness, and high ratio of length to thickness
Fabric (textile)	A manufactured assembly of fibres and or yarns which has substantial surface area in relation to its thickness and sufficient mechanical strength to give the assembly inherent cohesion.
Flannel	An all-wool fabric of plain or twill weave with a soft handle. It may slightly milled and raised.
Flat (weaving)	A place where warp ends are not leased in the correct order. For instance, two adjacent ends that pass together on the same side of the two lease rods in an otherwise end-and-end lease form a flat.
Flat Knitting Machine	A weft-knitting machine having straight needle beds carrying independently operated latch needles
Fastness	The property of resistance to the agency named(e.g. washing, light, rubbing, crocking, gasfumes)
Flourescent Tener Bright	A substance that is added to an uncoloured or a coloured textile material to increase the apparent

	reflectance in the visible region by conversion of ultra-violet radiation into visible light and so to increase the apparent brightness or whiteness of the textile material.
Filament	A long continuous man-made fibre.
Finishing	Treatment of fabric to improve properties
Greige	See grey goods.
Grey goods.	Woven or knitted fabrics as they leave the loom or knitting machine, I.e., before any bleaching, dyeing, or finishing treatment has been given to them.
Gabardine	Worsted fabric with pronounced twill face
Georgette	Crepe fine fabric with alternate twisted yarn
Hosiery	• In the generic sense, all types of knitted fabrics and goods made up there from . • In the restricted sense, knitted coverings for the feet and legs.
Interling	Woven or nonwoven fabric layer between outer cloth and lining of a garment for stiffening or giving warmth
Jacquard mechanism (Weaving)	A shedding mechanism, attached to a loom, that gives individual control of up to several hundred warp threads and thus enables large figure designs to be produced (Named after the inventor, Joseph Marie Jacquard)
Jersey Fabric	A generic term applied to knitted piece goods
J-Box	A J-shaped raugh or vessel for the processing of textiles from one process to another.

Jet-dyeing Machine	A machine for dyeing fabric in rope form in which the fabric is carried through a narrow throat by dye-liquor circulated at a high velocity. A machine for dyeing garments in which the garments are circulated by jets of liquid rather than by mechanical means.
Jig; Jigger	A dyeing machine in which fabric in open width is transferred repeatedly from one roller to another and passes each time through a dyebath of relatively small volume. Jigs are also frequently used for scouring, bleaching, and finsihfing.
Jacquard	A weaving machine to produce intricate woven design by controlling each warp yarn.
Jute	a multicellular bast fibre.
Knit	To form a fabric by the intermeshing of loops of yarn
Knitting Fabric	A fabric produced by the process of knitting
Knitting	A process of forming open work fabric by typing yarns when they cross one another interlocking a series of loops
Knot	Joining together by typing
Limitation Velvet	Plain weave with small tufts or fibres fixed by adhesive
Lace	Open work fabric.
Lawn	Light thin cotton fabric.
Lustre Lint	Gloss of textile
Linters	Whole and broken lint fibres and fuzz fibres, which are removed from the ginned cotton seed by a

special ginning process

Leno Weaving	A form of weaving in which warp threads are made to cross one another between the picks
Loom	A machine for producing cloth by weaving
Loop	The fundamental unit formed by the 'kinking' of yarn. In a knitted structure, this is supported by and interconnected with other units
Loop Length	The continuous length of yarn or fibres between the two successive lowest points of bindings of the pile in the substrate
Liquor Ratio	The ratio of the weight of liquor employed in any treatment to the weight of fibrous material treated
Listing	Synonym of selvedge. • An uneven dyeing effect consisting of a variation in colour between the slvedges and the centre of a dyed fabric, often cause in jig dyeing through a difference of temperature from the selvedges to the centre of the batched up cloth on the jig roller or by uneven batching up of the cloth on the rollers.
Matching	A process in which the proportions of the dyes present in a material are adjusted so that the final colour resembles that of a given sample as closely as possible
Madras Fabric	Thin cellulosic fabric wove with figures on lino foundation
Melange	A mixture of coloured stocks

Mohair	Fine lustrous hair of angora goat
Muslin	A fine plain white cotton fabric
Mercerization	The treatment of cellulosic textiles in yarn or fabric form with a concentrated solution of caustic alkali, whereby the fibres are swollen, the strength and dye affinity of the materials are increased and their handle is modified. The process takes its name from its discoverer, John Mercer.
Metameric Match	A match that is judged to be satisfactory under a particular illuminant but not under other illuminants of different spectral composition
Metamerism	A marked change in the colour of an object with a change in the spectral composition of the light by which it is viewed
Migration	The movement of an added substance, e;g., a dye or alkali, from one part of a textile material to another
Narrow Fabrics	Fabrics of 24-36 inch width
Net	Gestitchesometrically shaped mesh
Non Woven	Fabric from a web of fibres held together by various methods other than felting, colouring, or intertwining
Numdah Stitches	A felt Indian rug of goat's hair embroidered with colored chain stitches
Nylon	Synthetic polyamide fibre
Organdy	Thin transparent stiff effect on cotton.
Oxford	2/1 basket weave
Package Dyeing	Dying of yarn in packages

Pick And Pick Weaving	Weaving y alternate picks
Polyamide	Polymerized product of alcohols and acids
Poplin	A plain weave fabric with ribbed or corded effect
Power loom	Looms driven by power
Pick	To pass through the warp shed
Picking	The operation of passing the weft through the warp shed during weaving
Piece	A length of fabric of customarily accepted unit length
Pile	A surface effect on a fabric formed by tufts or loops of yarn, introduced into the fabric for the purpose, that stand up from the body of the cloth.
Pad-Steam Process	A process of continuous dyeing in which fabric in open width is padded with dyestuff and, if necessary, with a reducing agent, and is then steamed
Padding	The application of a liquor or paste to textiles, either by passing the material through a bath and subsequently through squeeze rollers, or by passing it between squeeze rollers, the bottom one of which carries the liquor or paste.
Pigment	A substance in partriculate form, which is substantially insoluble in a medium, but which can be mechanically dispersed in this medium to modify its colour and light scattering properties.
Polyester	A condensation polymer in which the simple chemical compounds used in its production (commonly polyhydric alcohols and polycarboxylic acid) are joined together by ester linkages.

Polymerization	A combination or association of molecules that may be of one compound or two or more compounds reacting simultaneously or consecutively to form a regular system of molecules(usually of high molecular weight), which behaves and reacts primarily as one unit, termed a polymer.
Raw Silk	Reeled silk directly from cocoon with slight twist
Reed (local, (sley)	A device consisting of several wires closely set between two slats or baulks that may serve any or all of the following purposes; separating the warp threads, determining the spacing of the warp threads, guiding the shuttle, and beating up the weft.
Reed	To draw ends through a reed (local to sley to bob the reed, or to enter the reed)
Reed Mark	A warp way crack in a woven fabric caused by a damaged or defective reed
Rib	A fabric in which all the loops of alternate wales are intermeshed in one direction and all the loops of the other wales knitted at the same course are intermeshed in the other direction
Reactive Dye	A dye that, under suitable conditions, is capable of reacting chemically with a substrate to form a covalent dye-substrate linkage. It is commonly used for dyeing cotton/woolen fibers.
Retarding Agent	A product which, when added to a dyebath, reduces the rates of dyeing but does not affect the final exhaustion.
Slub Yarn	Yarn in which slubs may be deliberately created to produce a desired effect
Spinning	The process, or the processes, used in the production of yarns or filaments

Shuttle (Weaving)	A yarn package carrier that is passed through the shed to insert weft during weaving
Sizing, Beam to Beam	The method of machine sizing in which a wrap is transferred form warp beam to loom beam.
Skew	A cloth condition in which the warp and weft yarns, although straight, are not at right angles to each other. The effect is due to the cloth's structure and is not a distortion imposed during processes subsequent to weaving
Stretch, Warp	The amount of stretching sustained by warp yarn during sizing operations. It is usually expressed as a percentage of the original length of un-sized warp.
Staple Length	A quantity by which a sample of fibrous raw material is characterized as regards its technically most important fibre length.
Stretch Fabric	A fabric characterized by a capacity for stretch and recovery from stretch.
Spirality	Distortion of a curcular-knitted fabric in which the wales follow a spiral path around the axis of the tube. Spirality is cause by the used of yarn that is twist lively, the direction and degree of spirality being influenced by the direction and degree of twist liveliness. The comparable defect on a flat knitted fabric is also referred to as wale spirality.
Shade	A common term loosely employed to describe broadly a particular colour or depth ,e.g, pale shade, 2% shade, mode shade, and fashion shade.
Shade	To bring about relatively small modifications in the colour of a substrate in dyeing by adding a further small amount of dye, especially with the object of matching more accurately with a given pattern.

Shrinkage The reduction in length (or width) of a fibre, yarn, or fabric. It may be induced by e.g., wetting, steaming, alkali treatment, wet processing as in laundering, or dry heat

Stenter; tenter

- An open-width fabric-finishing machine in which the selvedges of a textile fabric are held by a pair of endless travelling chains maintaining weft tension
- To pass through a stenter

Substantivity The attraction between a substrate and a dye or other substance under the precise condition of test whereby the latter is selectively extracted from the application medium by the substrate.

Surfactant An agent, soluble or dispersible in a liquid, which reduces the surface tension of the liquid.

Sulphur dye A dye that is normally applied from sodium sulphide solution. It is used for dyeing cotton fibers.

Twist

- The spiral disposition of the component(s)of a yarn, which is usually the result of relative rotation of the extremities of the yarn(s)
- The number of turns per unit length of yarn ,e.g., turns per meter

Terry Fabric A warp pile fabric with a pile in the form of loops, made principally in cotton and used for towelling, beach robes, bathspacemats, etc.

Twill A weave that repeats on three or more ends and picks and produces diagonal lines on the face of the cloth.

Terry, Warp Knitted A fabric produced with a continuous filament yarn for the ground construction and cotton or similar yarn for the pile. The terry loops may be formed by (a) over feeding of the pile yarn, (b) pressing and mis pressing, or c) forming loops on alternate needles and pressing these loops off.

Terry weft knitted	A term sometimes used as a synonym for weft knitted plush
Thickener	A substance of a gelatinous or gummy nature that is used to increase the viscosity of printing, dyeing, or finishing pastes or liquors.
Tumble	A frictionally driven, self-weighted, smooth, wooden or metal roller, wich rests on the material supported by the carrier. This is used on some worsted drawing boxes and spinning frames to control the fibres during drafting.
Union Cloth	A cloth made with warp of one kind of fibre and weft of another
Vat Dye	A water insoluble dye, usually containing ketonic groups, which is normally applied to the fibre from an alkaline aqueous solution of a reduced enol (lenco) form which is subsequently oxidized in the fibre to the insoluble form. It is used for dyeing cotton fibers.
Viscosity	The internal resistance to flow of a fluid. A term applied specifically to signify the viscosity of a standard solution of cellulose in cellulose in cuprammonium hydroxide solution, of specified copper and ammonia content. The viscosity is an indication of the degree of degradation of the cellulose.
Warp (Local chain)	• Thread lengthways in a fabric as woven • A number of threads in long lengths and approximately parallel, which may be put in various forms intended for weaving, knitting, doubling, sizing, dyeing, or lace-making.
Warp	To arrange threads in long lengths parallel to one another preparatory to further processing.