REPORT

OF THE

EXPERT COMMITTEE

ON

TECHNICAL TEXTILES

Volume - I

Government of India
Ministry of Textiles
Udyog Bhavan
New Delhi – 110 011

July, 2004

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PREFACE

Technical textiles is the emerging area for investment in India. Though India is the 2nd largest textile economy in the world after China, its contribution in the global technical textile industry is insignificant. The market size of technical textiles was estimated to have a volume of 16.71 mn. tonnes with a value of US $ 92.88 bn. and is expected to increase to 23.77 mn.tonnes with a value of US $ 127 bn. by the year 2010. Technical textiles account for over 25 percent of all fibre consumed and almost 50 percent of the total textile activity in certain industrialised countries. Even in China technical textiles accounted for 20 percent of the total textile consumption in the year 2000. However, in India the consumption of technical textiles is insignificant.

2. The potential of technical textiles in India is still untapped. To unleash the investment in this industry creating awareness and conducive environment for growth is essential. The Expert Committee on Technical Textiles (ECTT) decided to formulate an **action plan** for promoting the growth of the technical textiles in the country. For formulation of any action plan information on status of the industry is the pre-requisite; since this was lacking, committee decided to get the comprehensive survey done on status and potential of the industry in the country done and accordingly, awarded a comprehensive study to M/s. Tata Economic Consultancy Services (TECS) through a competitive bidding process. The TECS was requested to conduct the survey in three phases (**First phase** – status of the industry, directory of producers and users and impediments to growth etc.; **Second phase** - preparation of project profile of ten most promising and potential technical textile projects; **Third** phase - analysis of policies being pursued by various countries in the world and policy support required to be given by the government to promote technical textiles in the country.)

3. ECTT held a total of twelve meetings during its tenure of two years. The committee also invited experts from the different segments of the technical textile industry, research associations, IITs and existing entrepreneurs of the technical textile industry for interaction with the members. In its meetings the committee deliberated in detail on suggestions / recommendations for promotion of technical textile industry, problems of the existing entrepreneurs and measures to solve these problems. The committee also held interactive sessions with institutional users like Ministry of Health and Family Welfare, Ministry of Transport and highways, Dept. of Chemicals and Petro Chemicals, Ministry of Water Resources, Ministry of Railways, Ministry of Heavy Industry, Ministry of Defence and Ministry of Home Affairs. Four seminars were also organised in different parts of the country (at New Delhi, Chennai, Madurai, Surat) to create awareness about the potential of technical textiles in the industry and also to obtain suggestions of the entrepreneurs of those regions for promoting the growth of the technical textile industry.

4. Technical textiles represent a multi-disciplinary field with numerous end-use applications. Depending on the product specification and end-use applications,

the technical textile products have been broadly grouped into twelve sectors. Each of the twelve group covers, number of products and in all there will be hundreds of products. For providing focussed direction for growth, the committee decided to shortlist potential products based on industry's capability and market potential for initial prioritisation. Accordingly committee shortlisted twenty five products/ product groups. Since the knowledge base of technical textiles is limited the committee thought it prudent to get the project profiles made for certain products for the benefit of the potential investors. The project profiles were vetted by the sub-committee comprising of industry experts before finalisation. The project profiles would facilitate the decision making process of the potential investors with regard to investment in a particular product / product group.

5. This is also for the first time in the country that an attempt has been made to prepare a comprehensive report on various aspects of the diverse and complex technical textile industry. The report of the committee is basically an **'action oriented'** report covering two volumes. **Volume I** contains nine chapters and all appendices except appendices relating to project profiles. **Volume II** of the report covers the project profiles of the eighteen products / product groups. The Volume I of the report covers limited and focussed recommendations which are essential for promoting the growth of the industry. **A five-Year Action Plan** has also been detailed out in the report.

6. The implementation of the recommendations of the committee and initiation of the proposed action plan would **unleash the investment to the extent of Rs.10,000 - Rs.15,000 crore** during the next few years and India will be able to emerge as one of the technical textile economy to be **reckoned** with in the international scenario. The market size of the technical textile component of the technical textile industry in the country is estimated at Rs.19,130 crore during 2003-04 and Rs.29,580 crore in 2007-08

7. I acknowledge the contribution of Shri S. Satyam during the initial period of the committee's deliberations. I also acknowledge collective contributions and efforts made by the members of the committee particularly Shri Mohan Kavrie, Shri A.N.Jariwala, Shri M.K.Bardhan and Shri Y.K.Kusumgar. I also appreciate the assistance provided by members of the various sub-committees constituted to vet the project profiles. The dedicated efforts made by Smt. Shashi Singh, Director in my office in providing me assistance in organising the meetings, interactive sessions and in drafting of the report of the committee are also acknowledged with special thanks.

(Subodh Kumar)
Textile Commissioner &
Chairman of the Expert Committee.

Mumbai: July 27, 2004.

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LIST OF ABBREVIATIONS

ABS	Acrylic Butadiene Styrene
ARAI	Automotive Research Association of India
BBC	British Broadcasting Corporation
BCD	Basic Customs Duty
BIS	Bureau of Indian Standards
BS	British Standards
BTTG	British Textile Technology Group
CARG	Compounded Annual Rate of Growth
CBC	Carpet Backing Cloth
CE	Certificate for Healthcare Disposables
CENVAT	Central Value Added Tax
CMVR	Central Motor Vehicle Regulation
CRRI	Cetral Road Research Institute
CVD	Counter-Vialing Duty
DIN	German Standards
DRA	David Rigby Associates
DRDO	Defence Research & Development Organisation
ECTT	Expert Committee for Growth and Development of Technical Textiles
ECU	Electronic Control Unit
ECW	Extreme Cold Weather
EMA	External Market Assistance
EN	European Standards
EOU	Export Oriented Unit
EPDM	Ethylene Propylene Diene Monomer
EVA	Ethylene Vinyl Acetate
EVOH	Ethylene Vinyl Alcohol
FIBC	Flexible Intermediate Bulk Containers
FR	Fire Retardant
GDP	Gross Domestic Product
GRP	Glass Reinforced Plastic
GSM	Grams per Square Meter
HCV	Heavy Commercial Vehicles
HDPE	High Density Polyethylene
HEPA	High Efficiency Particulate Air Filters
IIT	Indian Institute of Technology
IJIRA	Indian Jute Industries Research Association
IJO	International Jute Organisation
IMC	Inter-Ministerial Committee
JMDC	Jute Manufacturers Development Council
LCV	Light Commercial Vehicles
LDPE	Low Density Polyethylene

LIST OF ABBREVIATIONS

MD	Machine Direction
MEG	Monoethylene Glycol
MES	Minimum Economic Size
MNC	Multi-National Company
MT	Metric Tonnes
MUV	Multi-Utility Vehicles
MVA	Motor Vehicles Act
NABL	National Accreditation Board for Laboratories
NBC	National Building Code of India
NSEW	North South East West
NTY	Nylon Tyre Yarn
NVH	Noise, Vibration & Heat
OEM	Original Equipment Manufacturer
OM	Office Memorandum
PBI	Poly Benz Imidazole
PBO	P-Phynelene 2,6-benzo bisoxazole
PBT	Poly Butylene Terephtahlate
PE	Poly Ethylene
PEN	Poly Ethylene Naphthalate
PFY	Polyester Filament Yarn
PGA	Poly Glycolic Acid
PLA	Poly Lactic Acid
POY	Partially Oriented Yarn
PP	Polypropylene
PPFY	Polypropylene Filament Yarn
PPS	Polyphenylene Sulphide
PSF	Polyester Staple Fibre
PTA	Purified Terypthalic Acid
PTFE	Poly Tetra Fluoro Ethylene
PTT	Polytrimethylene Terephthalate
PU	Polyurethane
PVA	Poly Vinyl Acetate
PVC	Poly Vinyl Chloride
PVDF	Poly Vinyledene Fluoride
RBO	Rice Bran Oil
RMG	Ready Made Garment

LIST OF ABBREVIATIONS

SAARC	South Asian Association for Regional Cooperation
SASMIRA	Synthetic & Art Silk Mill's Research Association
SBR	Steel Belted Radial / Styrene Butadiene Rubber
SCDGTT	Steering Committee for Development and growth of Technical Textiles
SMS	Spun-Melt-Spun
SSI	Small Scale Industry
TECS	Tata Economic Consultancy Services
TPA	Tonnes Per Annum
TRA	Textile Research Association
TUFS	Technolgy Upgradation Fund Scheme
UHMPE	Ultra High Performance Poly Ethylene
UHMWHDPE	Ultra High Molecular Weight High Density Polyethylene
UPS	Uninterrupted Power Supply
UV	Ultra Violet
VRLA	Valve Regulated Lead Acid

INTRODUCTION

The Expert Committee on Textile Policy has in its report of August 1999 highlighted the potential of technical textiles in the country and had made strong recommendation for promoting its growth to enable India to create a place for itself in the international technical textile scenario. The new textile policy-2000 has also enunciated that priority should be accorded for the growth and development of technical textiles in the country. The recommendations of the Expert Committee on Textile Policy, however, were not found adequate by the Govt. to formulate an action plan for exploiting the opportunities of technical textiles. Therefore, the Govt. decided to constitute an Expert Committee on Technical Textiles.

2. The Expert Committee for Growth and Development of Technical Textiles (ECTT) was constituted by the Govt. vide its OM No. 24/1/2001-A&MMT dated 04th July 2002 with Shri S. Sathyam, Retired Secretary to Govt. of India as Chairman and Shri Subodh Kumar, Textile Commissioner as Member Secretary. The composition and terms of reference of ECTT are at **Appendix - I**. The Govt. reconstituted the committee vide its OM No. 24/1/2001/A&MMT dated 20th March, 2003 by removal of two members and inclusion of three new members. Subsequently the Govt. replaced Shri S. Sathyam with Shri Subodh Kumar as Chairman, vide its letter no. 24/1/2001- A & AMMT dated 24/07/2003. The reconstituted composition of the committee is at **Appendix – II**.

3. As per the Office Memorandum of Govt. dated 04th July, 2002, the committee had to submit its report before 31st December, 2002 . Considering the wide terms of reference of the committee and also nascent stage of technical textiles in the country with insignificant information base, the committee in its deliberations found the time limit of six months for submission of report quite inadequate. Further, since the report of the TECS was the basic document on which ECTT report was to be prepared, the tenure of the committee had to be extended in sync with submission of the final report by the TECS. Accordingly, the Government on the request of the ECTT extended the tenure of the committee initially upto 31.12.2003; subsequently, the tenure of the committee was extended in stages upto 31.07.2004. ECTT has, however, submitted its interim report to the government in August 2003.

4. ECTT held a total of twelve meetings during its tenure of two years. The suggestions evolved in the various meetings of the committee, interactive sessions with the institutional users and knowledge gained by the members of the committee through interaction with the experts from industry, research associations and IITs were made use of by the committee while preparing its report. In addition, factual details from TECS study report were made use of by the committee while finalising the report.

*****

CHAPTER - 1

OVERVIEW OF THE TECHNICAL TEXTILE INDUSTRY WITH PARTICULAR REFERENCE TO GLOBAL SCENARIO

Introduction

Technical textiles are defined as textile materials and products used primarily for their technical performance and functional properties rather than their aesthetic or decorative characteristics. Other terms used for defining technical textiles include industrial textiles, functional textiles, performance textiles, engineering textiles, invisible textiles and hi-tech textiles.

1.2 An outstanding feature of the technical textile industry is the range and diversity of raw materials, processes, products and applications that it encompasses.

1.3 Technical textiles are used individually or as a component/part of another product. Technical textiles are used individually to satisfy specific functions such as fire retardant fabric for uniforms of firemen and coated fabric to be used as awnings. As a component or part of another product, they are used to enhance the strength, performance or other functional properties of that product as done by the tyre cord fabrics in tyres and interlining in shirt collars. They are also used as accessories in processes to manufacture other products like filter fabric in food industry or paper maker felt in paper mills.

1.4 Technical textiles have been slowly but steadily gaining ground due to one or more of the reasons such as: functional requirement, health & safety; cost effectiveness; durability; high strength; light weight; versatility; customization; user friendliness; eco friendliness; logistical convenience etc.

1.5 Unlike conventional textiles used traditionally for clothing or furnishing, technical textiles are used basically on account of their specific physical and functional properties and mostly by other user industries. Depending on the product characteristics, functional requirements and end-use applications the highly diversified range of technical textile products have been grouped into 12 sectors application wise:

i) **Agrotech** (Agriculture, horticulture and forestry)
ii) **Buildtech** (building and construction)
iii) **Clothtech** (technical components of shoes and clothing)
iv) **Geotech** (geotextiles, civil engineering)
v) **Hometech** (components of furniture, household textiles and floor coverings)
vi) **Indutech** (filtration, cleaning and other industrial usage)

vii) **Meditech** (hygiene and medical)
viii) **Mobiltech** (automobiles, shipping, railways and aerospace)
ix) **Oekotech** (environmental protection)
x) **Packtech** (packaging)
xi) **Protech** (personal and property protection)
xii) **Sporttech** (sport and leisure)

International Scenario

1.6 The trend in the various sectors in the textile industry in many industrialised countries indicate that the use of conventional textiles has reached a static level and its manufacture has become highly competitive, often unviable and many companies are switching over to value-added technical textiles with capability to meet functional demands for precision applications. As use of technical textiles is dictated by need, its pricing normally offers good margins. There is a steady growth of both consumption and production of technical textiles throughout the world.

1.7 Latest study on 'World Market Forecasts for 2010 of technical textiles and industrial non-wovens" by David Rigby Associates (DRA) indicates that :

- In the year 2000, the World market for technical textiles was estimated to have a volume of 16.7 mn. tonnes with a value of US$ 92.88 billion.
- Average annual world-wide growth in volume terms is expected to be 3.60 percent for the period between 2000 to 2010.
- It is forecast that the global consumption of technical textiles will amount to 23.77 mn. tonnes by the year 2010 and a value of US$ 127 billion.
- In the year 2000, the total textile fibre consumed in the World was 62.2 mn. tonnes, out of which consumption of technical textiles was 16.7 mn. tonnes. USA & western Europe accounted for 23 percent and 22 percent respectively, followed by China with 13 percent and Japan with 7 percent. Remaining 35 percent was consumed by other countries.
- In Asia, the annual growth rate is projected to be 4.23 percent during the period 2000-2010 as against 2.60 percent in North America and 2.14 percent in Western Europe.
- Technical textiles account for over 50 percent of the total textile activity in certain industrialised countries.
- A view is gaining ground that technical textile industry in the developed world is maturing in some significant ways and growth of technical textiles in developed economies is expected to be moderate. In contrast,

China, India and other countries in Asia, America and Eastern Europe are expected to experience healthy growth in the near future.

Segment-wise market size of technical textiles :

1.8 In the global context, sector-wise contribution expected, future growth and ranking of the 12 sectors is given in Table - 1.1 as follows :

Table – 1.1

Segment-wise market size of technical textiles

Volume – '000 tonnes
Value – US$ mn.

Technical Textile Sectors	Year						CARG (%)	
	2000		2005		2010			
	Volume	Value	Volume	Value	Volume	Value	Volume	Value
Mobiltech	2479	25629	2828	26861	3338	29282	3.02	1.34
Indutech	2205	13405	2624	16687	3257	21528	3.98	4.85
Sporttech	989	13897	1153	16052	1382	19062	3.40	3.21
Buildtech	1648	5872	2033	7296	2591	9325	4.63	4.73
Hometech	2186	6750	2499	7622	2853	8778	2.70	2.66
Clothtech	1238	6070	1413	7014	1656	8306	2.95	3.19
Meditech	1543	5391	1928	6670	2380	8238	4.43	4.33
Agrotech	1381	5541	1615	6568	1958	8079	3.55	3.84
Protech	238	5193	279	5873	340	6857	3.63	2.82
Packtech	2552	4393	2990	5329	3606	6630	3.52	4.20
Geotech	255	740	319	927	413	1203	4.94	4.98
Total	**16714**	**92881**	**19681**	**106899**	**23774**	**127288**	**3.59**	**3.20**
of which Oekotech	214	800	287	1039	400	1389	6.45	5.67

Source : DRA.

1.9 It is observed that as per David Rigby Associates the technical textiles is expected to grow at around 3.60 percent in volume terms and 3.20 percent in value terms. Differential growth rates in volume and value terms indicate pressure on margin and/or production of low value items.

1.10 Mobiletech which is largest segment of the technical textile industry is expected to experience maximum differential between Compounded Annual Rate of Growth (CARG) in quantum & value terms.

1.11 Contribution of the different segments to the market size of the technical textiles is placed in Table-1.2 overleaf:

Table – 1.2

Segment-wise market size of technical textiles

Value – US$ mn.

Technical Textile Sectors	Year					
	2000		2005		2010	
	Value	% to Total	Value	% to Total	Value	% to Total
Mobiltech	25629	27.59	26861	25.13	29282	23.00
Indutech	13405	14.43	16687	15.61	21528	16.91
Sporttech	13897	14.96	16052	15.02	19062	14.98
Buildtech	5872	6.32	7296	6.83	9325	7.33
Hometech	6750	7.27	7622	7.13	8778	6.90
Clothtech	6070	6.54	7014	6.56	8306	6.53
Meditech	5391	5.80	6670	6.24	8238	6.47
Agrotech	5541	5.97	6568	6.14	8079	6.35
Protech	5193	5.59	5873	5.49	6857	5.39
Packtech	4393	4.73	5329	4.99	6630	5.21
Geotech	740	0.80	927	0.87	1203	0.95
Total	**92881**	**100.00**	**106899**	**100.00**	**127288**	**100.00**

Source : DRA.

1.12 It is observed that mobiletech was the largest segment in 2000 contributing about 28 percent in value terms. By 2010, it is expected to continue to be largest segment but its share would decline to 23 percent.

1.13 The largest segments of the technical textile industry are Mobiletech, Indutech and Sporttech which contribute about 55 percent to 57 percent of the market share.

1.14 The segments whose share is expected to decline by 2010 are Mobiletech, Hometech, Clothtech and Protech.

Region-wise technical textile consumption:

1.15 The maximum consumption of technical textiles is in USA & Western Europe and Japan, together these three regions account for 65 percent of the consumption of technical textiles in the world. The details are given in Table-1.3:

Table – 1.3

Technical textile consumption by Region

Region	Technical Textiles consumption (%)
USA	23
Western Europe	22
China	13
Japan	7
Rest of the World	35

Source : DRA.

Fibre consumption in technical textiles :

1.16 Technical textiles are predominantly man-made fibre/yarn based because of inherent advantages of strength & versatility of such fibre/yarn and this trend is expected to continue in future also as per details given below:

Table – 1.4

Fibre consumption in technical textiles

Volume – '000 tonnes

Fibre Type	Year			CARG (%)
	2000	2005	2010	
Natural	3462	3839	4447	2.54
Man-made / Inorganic	13252	15843	19327	3.85
Total	**16714**	**19682**	**23774**	**3.59**

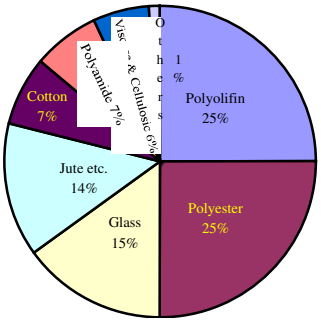
Source : DRA.

1.17 The share of man-made / inorganic fibre in the total fibre/yarn consumption is expected to increase from 79 percent in 2000 to 81 percent in 2010.

1.18 Fibre-wise consumption of technical textiles for the year 2000 indicates that polyoliefin and polyester accounted for 50 percent of the consumption followed by glass and jute etc. at 15 percent and 14 percent respectively. Fibre-wise consumption details are given in Chart – 1.1.

Chart – 1.1

Fibre consumption in technical textiles



Source : DRA.

1.19 It is also observed that despite cosnsiderable attention paid to higher value speciality fibres such as aramids and carbon fibre, the standard textile fibres account for 99 percent of all textile materials used in technical textile applications.

Product-wise consumption of technical textiles :

1.20 Technical textiles are consumed in the form of unspun fibres, yarn and in the fabric form. Product-wise consumption of technical textiles for the year 2000 is given in Table – 1.5.

Table – 1.5

Product-wise consumption of technical textiles

Volume – '000 tonnes

Final Textile product	Year					
	2000		2005		2010	
	Volume	% to Total	Volume	% to Total	Volume	% to Total
Unspun fibres	4004	23.96	4774	24.25	5763	24.24
Yarn type products	1570	9.39	1776	9.02	2079	8.74
Fabrics	11140	66.65	13133	66.73	15932	67.02
Total	**16714**	**100.00**	**19683**	**100.00**	**23774**	**100.00**

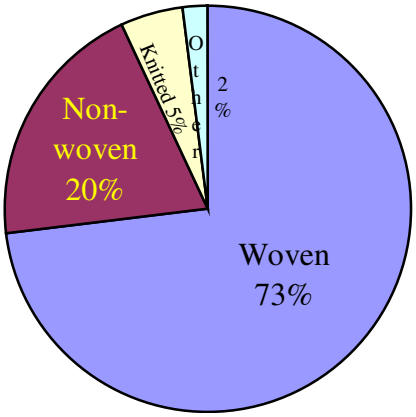
Source : DRA.

1.21 It is observed that the maximum consumption is in the form of fabric at 67 percent followed by unspun fibre at 24 percent and yarn at 9 percent. The same trend is expected to continue till 2010.

1.22 The global end-use of technical textiles is predominantly in fabric form and that too in woven fabric form. Global end-use of technical textile fabric is given in Chart – 1.2.

Chart – 1.2

Global end-use of technical textile fabric



Source : DRA.

1.23 It is observed that 73 percent of the fabric consumed is woven, 20 percent non-woven, followed by 5 percent of knitted fabric.

1.24 Non-wovens constitute an important segment of the technical textile fabrics. Their major use is in meditech (33 percent) followed by buildtech (15 percent) and clothtech (14 percent). The details are given in Table - 1.6 below:

Table – 1.6

Global end-use consumption of non-woven fabrics (Volume- 2000)

Technical Textile Sector	Consumption (%)
Meditech	33
Buildtech	15
Clothtech	14
Indutech	12
Hometech	12
Mobiletech	6
Geotech	3
Others	5

Source : DRA.

Major technical textile products

1.25 There are many technical textiles having numerous applications. More important examples of technical textile products are given in Table – 1.7.

Table – 1.7

Examples of technical textile products

1.	***Fibres***	Reinforcement for composites, cushioning, fillings, electrical components, Insulation, Sports equipment, toys.
2.	***Yarn type products***	Sutures, Ropes, Fishing gears, shoe components, swings, etc.
3.	***Fabrics***	
(i)	***Woven fabrics***	Filtration, Flexible Bulk Containers, Conveyor belts, luggage, carpet and carpet backing, PVC coating substrates, Tarpaulin, Furniture components, Bed Ticking, Protective clothing, Electrical components, Geotextiles, sports and leisure wear, Wound care, Bandages, Insulation tapes, Narrow fabrics, Compression bandages.
(ii)	***Knitted fabrics***	Luggage, Fishing nets, Shoe components, Cleaning cloths, Filtration, Protective clothing, Sports and leisure wear, PVC coating substrates, knitted geogrids.
(iii)	***Non-wovens***	Coverstock-sanitary napkins & diapers, Pollution Control and other Air & liquid filtration, Garment Interlinings & Waddings, Geotextiles, Carpets-Home & Automotive, Shoe Components, Insulations, Cleaning Wipes, Personal & Medical disposables Furniture Industry, PVC coating substrates.

1.26 Technical textiles have entered our lives extensively, though we may not be aware of the extent of their usage. Some of the technical textile products, which are used in the day to day life are given below:

Table – 1.8

Some examples of day-to-day use of technical textile products

Sr. No.	Applications	Products
1	**Kitchen**	Wipes, Floor Mops, Tea Bags, Coffee Filters
2	**Clothe**	Collar / Cuff Interlinings, Shoulder Pads, Waddings in Jackets
3	**Shoe**	Lining, Insoles, Toe Stiffners, Synthetic Uppers
4	**Car**	Carpets, Roof-liners, Insulations, Air Filters
5	**Civil Engineering**	Geotextiles in Roads, Railway Tracks, Soil Erosion, Slope Stabilisation
6	**Furnishing**	Carpets, Vertical Blinds, Wall Coverings
7	**Factory**	Dust Collection Filter Bags, Liquid Filtration, Clean Air Filters of AC systems
8	**Hospital**	Masks, Gowns, Caps, Dressing, Bandage
9	**Hygiene**	Baby Diaper, Sanitary Napkin, Wet Tissues
10	**Bed**	Blanket, Quilts, Mattresses

Technology for technical textiles

1.27 Depending on the product range, diverse technologies are used for production of technical textiles. Details of technology for different product types are given in Table – 1.9 below :

Table – 1.9

Technology for production of technical textiles

Sr. No.	Technical textiles (basic material)	Technology for technical textiles
1	***Un-spun Fibres***	Fibre extrusion technology
2	***Yarn assemblies***	Braiding / (27 percent) Twisting / cabling / plying (73%)
3	***Fabrics***	
(i)	***Woven Fabrics***	Broad Woven (91 percent)
		Narrow Woven (5 percent)
		Circular Woven (4 percent)
		Triaxial weaving / 3-D weaving / block weaving (1 percent)
(ii)	***Knitted Fabrics***	Warp knitted (74 percent)
		Weft knitted including WIWK (26 percent)
		Sliver knitted (< 1 percent)
(iii)	***Non-woven Fabrics***	**Web formation** Drylaid (44 percent)
		Airlaid (3 percent)
		Wetlaid (16 percent)
		Extruded (37 percent)
		Bonding Technology Needle punch, chemically bonded, thermally bonded, spunlace, stitchbond, spunbond
(iv)	***Other Fabrics***	Tufted
		Knotted nets

1.28 Major future growth areas of technical textiles in the global context are projected to be :

- **Medical & Personal Hygiene;**
- **Sports and leisure;**
- **Environmental protection;**
- **Pollution Control & Filtration;**
- **Garment & Shoe Industry**.

1.29 Future market potential and performance of the different technical textile sectors including composition of the technical textile products in Indian technical textile sectors would be very different from what has been projected for the global

market. For example, geo textiles is a potential area in India in view of the major investments required to be made by the Government on infrastructure development, while in Western countries and most of the East Asian countries since infrastructure like roads, ports etc. is already built, geotech may not be a high growth area.

CHAPTER - 2

STATUS AND PROSPECTS OF THE DOMESTIC TECHNICAL TEXTILE INDUSTRY

The production of different items of the technical textile industry has been slowly but steadily increasing in the country. However, there is lack of data regarding status of the domestic technical textile industry. Therefore, ECTT decided in its first meeting itself that a comprehensive study should be taken up in order to provide a reliable database on the status and potential of technical textile industry in the country. Accordingly, the study was given to Tata Economic Consultancy Services (TECS) through a competitive bidding process. The TECS survey covered three phases (**first phase** – status of the industry, directory of producers and users and impediments to growth etc.; **Second phase** - preparation of project profile of ten most promising and potential technical textile projects; **Third phase** - policy support required to be given by the government to promote technical textiles in the country.) The status of the industry as discussed in this chapter has drawn heavily from the Phase-I report of the TECS.

2.2 The Indian industry produces items of all the twelve segments of the technical textile industry though in varying quantities. Some items are produced in significant quantity while some other items are produced in small quantity with most of the requirement being met through imports..

2.3 The production of technical textile items in the small scale sector in an unorganised fragmented manner is also significant.

2.4 The technology used by the small and medium scale units is, by and large, traditional. Not many projects are based on state-of-the-art-technology comparable to global players. The reason for low level of technology could be attributed to non-availability of indigenous machinery and also lack of knowledge about the latest machinery available in the world market or risk perception in such investment.

2.5 The market size and potential of technical textile component in twelve segments of the technical textile industry has been estimated at Rs.19,130 crore during the year 2003-04 and Rs.29,579 crore in 2007-08. Since in some products technical textile forms a part of the product, the market size of the finished

products has also been estimated. The segment-wise details are given in Table-2.1 below:

Table - 2.1

Segment-wise market size and potential of technical textile industry

(Rs. crore)

Sr. No.	T. T. Sector	Market Size (Estimated)		Potential market
		2001-02	2003 – 04	2007 – 08 (Projected)
1	MOBILTECH	1276.40	1662.57	2722.58
	(T.T. Component)	*(1169.24)*	*(1381.55)*	*(1699.21)*
2	MEDITECH	1193.29	1483.31	2339.74
	(T.T. Component)	*(777.86)*	*(932.95)*	*(1422.79)*
3	SPORTTECH	5389.75	6284.15	8489.51
	(T.T. Component)	*(1309.75)*	*(1534.15)*	*(2049.51)*
4	PROTECH	347.50	520.25	1288.50
	(T.T. Component)	*(347.50)*	*(520.25)*	*(1288.50)*
5	INDUTECH	2622.00	3111.60	4484.89
	(T.T. Component)	*(819.00)*	*(961.93)*	*(1368.93)*
6	GEOTEXTILES	110.00	350.00	2854.00
	(T.T. Component)	*(110.00)*	*(350.00)*	*(2854.00)*
7	PACKTECH	3587.68	4602.00	7359.28
	(T.T. Component)	*(3197.68)*	*(4086.00)*	*(6497.28)*
8	OEKOTECH	0.00	14.70	117.56
	(T.T. Component)	*(0.00)*	**(14.70)**	*(117.56)*
9	AGROTECH	261.00	303.56	464.70
	(T.T. Component)	*(261.00)*	*(303.56)*	*(464.70)*
10	CLOTHTECH	5395.13	6833.20	8415.80
	(T.T. Component)	*(5395.13)*	*(6833.20)*	*(8415.80)*
11	BUILDTECH	1051.10	1181.58	1503.25
	(T.T. Component)	*(1051.10)*	*(1181.58)*	*(1503.25)*
12	HOMETECH	757.86	1029.72	1897.70
	(T.T. Component)	*(757.86)*	*(1029.72)*	*(1897.70)*
	TOTAL	**21991.71**	**27376.64**	**41937.51**
	(T.T. Component)	*(15196.12)*	*(19129.59)*	*(29579.23)*

T. T. Component – Technical textile component.

2.6 The potential market size for different technical textile items has been projected upto 2007-08. However, considering the scope for technical textiles and its nascent stage of production in the country, the growth will continue even after 2007-08 and may be at higher rate due to global market opportunities available.

2.7 The technical textile items covered under the technical textile industry are discussed below segment-wise.

2.8 MOBILETECH

2.8.1 The automotive industry including applications in vehicles, aircraft and ships is the largest single consumer of technical textiles in the world, which is having about 25 percent share of the total technical textiles market. However, in India the share of mobiltech is 7 percent in technical textiles market.

2.8.2 Some of the textile components used in automobiles are visible while the others are concealed. These are as follows:

(i) **Visible components** – upholstery, carpets, seat belts, headliners etc.

(ii) **Concealed components** – tyre cords, hoses, belts, air bags, air and fuel filters, noise and vibration dampening and body panel reinforcement in composites etc.

2.8.3 It is estimated that about 45 square metres of textile material is used in an average car and the percentage of textiles in a car is about 2 percent of the overall weight of the car. A large number of textile fibres in different forms and construction are used in specific component depending on the stringent functional requirement. In the last few years, there has been a remarkable growth in models of both passenger and utility vehicles in India. Thus, there is a tremendous market opportunity for automotive textiles as a major component of the vehicle.

2.8.4 The existing and potential market size of the different items of mobiltech is given in Table 2.2 below:

Table 2.2

Product-wise market size of mobiletech segment

(Rs. crore)

Sr. No.	Item	Market size (Estimated)				Market Potential	
		2001-02		2003-04		2007-08 (Projected)	
		Qty.	Value	Qty.	Value	Qty.	Value
1.	Seat Belts (S. B.)	1.92 mn. nos.	96.00	5.19 mn. nos.	259.50	7.45 mn. nos.	372.50
	S. B. Webbing Other Rigid Webbings	5.76 29.47 mn. mt.	9.22 23.58	15.57 34.38 mn. mt.	24.91 27.50	22.35 50.33 mn. mt.	35.76 40.26
	Total Webbings (TTC)	35.23	(32.80)	49.95	(52.41)	72.68	(76.02)

(Rs. crore)

Sr. No.	Item	Market size (Estimated)				Market Potential	
		2001-02		2003-04		2007-08 (Projected)	
		Qty.	Value	Qty.	Value	Qty.	Value
2.	Airbags	25000 Nos.	10.00	50000 Nos.	25.00	14.48 Lakh. Nos.	724.00
	Textile bag (TTC)		(1.00)		(2.50)		(72.40)
3.	Nylon tyre cord fabric (100% TTC)	65000 tonnes	812.00	72000 tonnes	900.00	75000 tonnes	937.00
4.	Seat Covers (fixed & loose) (100% TTC)	2.50 mn. mtrs.	68.75	3.90 mn. mtrs.	107.25	5.96 mn. mtrs.	163.90
5.	Car body covers (100% TTC)	50,000 pieces	3.75	55,000 pieces	4.06	80,000 pieces	6.00
6.	Automobile interior carpets (100% TTC)	2.50 mn. sq. mt.	25.00	5.00 mn. sq. mt.	50.00	8.00 mn. sq. mt.	80.00
7.	Helmets (100% TTC)	12.65 lakh. nos.	204.50	13.95 lakh. nos.	233.70	20.30 lakh. nos.	317.55
8.	Headliners	1.34 mn. sq. mt.	43.00	1.98 mn. sq. mt.	63.30	2.90 mn. sq. mt.	92.67
	(TTC)		(8.04)		(11.87)		(17.38)
9.	Insulation felts (100% TTC)	6.31 lakh no.	13.40	9.89 lakh no.	19.76	14.48 lakh no.	28.96
	Total (TTC)	**-**	**1276.40 (1169.24)**	**-**	**1662.57 (1381.55)**	**-**	**2722.58 (1699.21)**

TTC – Technical textile component.

2.8.5 In the mobiltech segment, the Nylon tyre cord / fabric is the largest segment accounting for about 81 percent of share in 2001-02. However, it is expected to decline to 55 percent by 2007-08.

2.8.6 The mobiltech segment comprises seat belts webbing, airbags, nylon tyre cord fabric, seat covers, automobile interior carpet, car body cover, helmets, headliners, insulation felt. Each of these items is discussed in the following paragraphs:

Webbings for seat belts:

2.8.7 Seat belts are used by the four wheeler automobile sector, (i.e., passenger cars, light / medium / heavy trucks, buses) and also aircrafts and helicopters. The

technical textile portion in a seat belt is the webbing and pre-requisites of the webbing are light weight; high abrasion resistance; excellent recovery characteristics; heat and light resistance and flexibility in use etc.

2.8.8 High tensile polyester filament yarn (1000 / 1200 / 1500 / 1600 dtex) and nylon filament yarn (180 / 470 / 940 dtex) are the main yarn used for webbings.

2.8.9 Warp direction in the belt is more important since the load is applied mainly in that direction. Normally twill or satin type finish is used. The webbing is normally of standard length and width, woven on needle looms.

2.8.10 . Seat belt producers follow the AIS 2005 / 2000 safety seat assembly specifications developed by Automotive Research Association of India (ARAI, Pune). ARAI is NABL accredited R & D Institute.

2.8.11 Demand for seat belts has increased after issuance of Government Notification under Central Motor Vehicle Regulation (CMVR) stipulating that all four wheelers will be equipped with front and rear seat belts. As per the Supreme Court Notification all State Governments are expected to ensure that the driver and co-driver use the seat belts.

2.8.12 Realising the opportunity for seat belts in the growing Indian market, some of the major seat belt global players (i.e., IFB Autolive India, (Bangalore); Abhishek Auto Industries Ltd., (Gurgaon); Bond Safety Belt, (Mumbai); TRW Rane Occupant Restraints Ltd., (Chennai)), have set up their shops in India as Joint Venture projects. However, all these seat belt producers are meeting their requirement of webbings through import. There is not a single indigenous producer of seat belt webbings in the country.

2.8.13 Thus the seat belt manufacture has been indigenised but the webbing requirement is met through imports. The critical factors favouring import of webbings are rigid technical specifications, cost and consistency in meeting the quality standards. Further, for the manufacture of webbing high tenacity polyester filament yarn is used, which is not produced indigenously and imported yarn is costly on account of high rate of customs duty; therefore seat belt manufacturers find it more economical to import webbings.

2.8.14 The implementation of MVA in most States remains lax. For example, in Mumbai wearing of seat belt is compulsory for the driver but not for the co-passenger where as in Delhi it is required for both. Like wise, for taxi, trucks and bus drivers use of seat belts is not compulsory in Mumbai.

2.8.15 It is also observed that sub-standard quality nylon seat belts are imported in large numbers through unofficial channels and sold by retailers to such customers who wish to retrofit seat belts in old cars. Nylon seat belts are available in the price range of Rs.75-150 per piece, as against price of about Rs.500 per piece for standard quality seat belts.

2.8.16 The Ministry of Road Transport & Highways in collaboration with the local State Authorities should insist on use of seat belts of quality standards. Otherwise, the very purpose of seat belt as safety device will be defeated.

2.8.17 Future market potential for seat belts is linked to the anticipated increase in production of cars / MUV in India. Based on the anticipated growth of cars / MUV, market for seat belts estimated at 5.19 million numbers with value of Rs. 259.50 crore in 2003-04 is expected to increase to 7.45 million numbers with value of Rs.372.50 crore in 2007-08. Corresponding requirement of webbings is estimated at 15.57 mn. mtrs. in 2003-04 and 22.35 mn. mtrs. in 2007-08 with value of Rs.24.91 crore and Rs.35.76 crore respectively.

2.8.18 In addition to seat belt webbings, other rigid narrow and heavy duty webbings such as slings, parachute belts, net webbings, break parachute webbings etc. are also produced. Such webbings are produced indigenously from nylon filament yarn, polyester filament yarn and polypropylene filament yarn. The demand for these type of webbings is estimated at 34.38 mn. mtrs. with value of Rs.27.50 crore in 2003-04 and is projected at 50.33 mn. mtrs. with value of Rs.40.26 crore in 2007-08.

Airbags :

2.8.19 Airbag is an automatic electronic safety control system built into steering wheel and other strategic locations of the vehicle. With a combination of seat belt and airbag serious chest injuries in frontal collision can be reduced by 65 percent and serious head injuries by upto 75 percent.

2.8.20 A modern frontal airbag system consists of Electronic Control Unit (ECU) and one or more airbag modules. The airbag module consists of an inflator (or gas generator) with an initiator, a textile bag (cushion), housing for driver bags and cover for the steering wheel.

2.8.21 The textile bag is made up of nylon or polyester and folded in a specific way to make the unfolding fast and safe. The cushion is woven from the yarn on loom. The main requirements in airbag fabric are : energy absorption; heat

stability; high strength; good ageing characteristics; functionality at extreme hot and cold conditions; coating adhesion etc.

2.8.22 Most widely used synthetic yarn for airbag cushion is nylon 6.6 in the denier range of 420 to 840. Driver side airbags are coated with black neoprene rubber or silicon rubber while passenger side airbag is uncoated.

2.8.23 In the developed and major car producing countries of USA, Europe, Japan and Korea, airbags for driver and front seat passengers are an integral part of the automobile. Though India has made significant progress in the manufacture of car, very few cars made and sold in India have airbag system. However, for cars exported from India where airbag installation is mandatory, supply is met through imports.

2.8.24 Realising the importance of the safety of persons travelling in commercial vehicles, the laws for the installation and use of seat belts were introduced. However, no such provision exists for airbags in MVA. It is, therefore, necessary that mandatory laws are introduced for installation of airbags in new vechicles.

2.8.25 Future market potential for airbags is linked to the introduction of mandatory laws. Assuming that these laws will be issued by 2005-06 and will come into force in 2007-08, the market for airbags is estimated at Rs.724.00 crore in 2007-08. Correspondingly value of technical textiles in airbag at 10 percent of the value of airbag is estimated at Rs.72.40 crore.

Nylon tyre yarn cord fabric:

2.8.26 In automotive tyre sector, Nylon Tyre Yarn (NTY) due to its technical superiority has replaced rayon and cotton. NTY is used as reinforcement material for the manufacture of tyres for heavy commercial vehicles (HCVs), light commercial vehicles (LCVs), buses, multi-utility vehicles (MUVs), two wheelers, tractors and other vehicles.

2.8.27 NTY of deniers 1260, 1680 and 1890 is normally used for manufacture of NTY cord fabric.

2.8.28 The installed capacity of nylon industrial yarn in the country is 65,000 MT. However, since 3 units are closed, the effective working production capacity is 49500 MT.

2.8.29 Demand for nylon tyre yarn cord fabric is linked to the production of automotive tyres covering different automobile segments. It is observed that

during the year 2001-02, 65000 MT of NTY was consumed. Out of this, 75 percent was consumed by commercial vehicle sector followed by two wheelers and passenger cars with 8 percent each and others 9 percent. Rayon high performance tyros are used for high performance high speed cars.

2.8.30 India has been passing through a evolutionary stage of tyre technology from bias cotton, bias rayon, bias nylon to textile belted radial, textile / steel belted radial. Radial tyres have an advantage over cross ply (bias) tyres in terms of greater tread life, better fuel economy, lower vehicle maintenance etc. Thus, there is expected to be a greater penetration of steel radials in tyres, particularly after improvement in infrastructure facilities

2.8.31 The radialisation of tyre industry would have an impact on future demand for NTY and consumption by the trucks / bus tyre segment will go down significantly. In this background, it is estimated that till such time as the radialisation process is slow, the demand for nylon tyre yarn cord fabric will marginally increase at about 5 percent based on past trends. But thereafter, the consumption of nylon tyre yarn cord fabric is expected to decline gradually because all steel radial tyres use very small quantity of nylon tyre yarn cord fabric (about 2 percent) as against about 10 percent of tyre now.

2.8.32 Accordingly, the market size for nylon tyre yarn cord fabric is estimated to increase marginally from Rs.900 crore in 2003-04 to Rs.937 crore during the year 2007-08.

Seat covers :

2.8.33 Seat cover is the visible component of the technical textiles used by the automobile sector. Woven / knitted technical textile fabrics for seat covers satisfy the performance requisite, i.e., fastness to light and ultra-violet resistance; dimensional stability; abrasion resistance; fire retardancy; tensile and tearing strength; soft surface and attractive designs and appearances etc.

2.8.34 The seat upholstery woven / knitted fabrics are normally made from polyester filament yarn in denier range of 500-1300 (or blends) and these fabrics, could be plain, dobby, jacquard, velvet or embossed.

2.8.35 The requirement of upholstery material is estimated at around 12 mn. mtrs. (2001-02) and out of this 12 mn . mtrs. 21 percent is only textile fabric while remaining 79 percent is PVC / PU / coated fabric. Normally, synthetic leather, (i.e., PVC / PU/ coated fabric) is used in buses, trucks, taxis, two and three

wheelers whereas textile woven / knitted fabric is mainly used for cars / MUVs. Further, it is expected that since the synthetic leather is generally cheaper (Rs.70-90 per mtr. as against Rs. 200-350 per mtr for textile fabric) and more durable it would continue to be preferred by vehicles used for commercial purposes.

2.8.36 The major producers of woven / knitted car upholstery fabrics are Bhilwara Melba Dewitta Limited, Shamken Multifab Limited and Faze Three Limited.

2.8.37 Future demand for textile upholstery is linked to increase in the production of passenger cars which is expected to grow at the rate of 8 percent per annum. Accordingly, market potential for the textile fabric is estimated to increase from Rs.107 crore in 2003-04 to Rs.164 crore in 2007-08.

Car Body Cover :

2.8.38 The car body cover is an optional accessory for the protection of car when not in use. Current market is around 55,000 pieces per annum. The price range for this cover is from Rs.250 to Rs. 3000 per piece depending on the material used. HDPE / plastic covers are available in the range of Rs.250- Rs.400 per piece, while nylon and parachute like material car covers are avaialble in the range of Rs.1500-Rs.3000 per piece.

2.8.39 The market potential for car body cover is very limited and the market is expected to grow at around 10 percent in volume terms. Accordingly, market is expected to grow to 80,000 pieces with value of Rs.6.00 crore by 2007-08.

Automobile interior carpets:

2.8.40 All cars produced in the country have company fitted carpets in the main passenger cabin and dicky. The average carpet used per car is about 5 sq. mtrs. Most of the carpets are moulded to fit the body.

2.8.41 Some of the suppliers of carpets are Hitkari Fibres Limited, Mumbai, Uni products, Mumbai, Bajaj carpets, Noida, Supreme Nonwovens Limited, Mumbai etc.

2.8.42 Automobile interior carpet market is growing and future potential is promising and is expected to increase from 5.00 mn. sq. mtrs. with value of Rs.50 crore in 2003-04 to 8 mn. sq. mtrs. with value of Rs.80 crore in 2007-08.

Helmets:

2.8.43 Helmets used for the two wheelers are generally categorized as commodity item. Most commonly used raw material for outer shell of the helmet is fiberglass for uniform impact protection. Other raw materials used are ABS, expanded polystyrene etc. Inside the helmet cushioning material and narrow fabric straps / velcro are used. The helmets manufactured by some of the recognized Indian players match the international standards of the developed countries and follow BIS 4151.

2.8.44 The use of helmets in two wheelers for the driver and the pillion rider has become mandatory in most States and Union territories.

2.8.45 Major manufacturers of helmets are : Studd Accessories Ltd., Forma Sports Pvt. Ltd., Vega Auto Accessories Pvt. Ltd., Wrangler International and Aerostar Helmets Ltd. etc.

2.8.46 The helmets are available in the price range of Rs.250 (open faced) to Rs.450-Rs.1000 (full faced) depending on the brand. However, in Delhi, roadside helmets are available for Rs.100-Rs.200 normally manufactured and supplied by the units in the decentralized sector.

2.8.47 The market potential for helmets is linked to the future production of two-wheelers (new market) and replacement market as well the implementation of the mandatory use for two wheelers in states like Maharashtra and Gujarat.

2.8.48 The future market for two wheeler helmets is estimated to increase from 13.20 lakh nos. valued at Rs.46.20 crore in 2003-04 to 19.30 lakh nos. valued at Rs.67.55 crore in 2007-08.

2.8.49 Ballistic helmets are specially designed for Armed Forces, Para Military, Police and other Law Enforcement Agencies. Head being the most vulnerable part of the body, requires the best possible protection. Ballistic helmets are tough, durable, reliable and reflect state-of-the-art technology and use of speciality fibres (like Kevlar).

2.8.50 There are different types of ballistic helmets depending on the usage and operating conditions. Some of these helmets are:

- **Ballistic Helmets** : This is the lightest, safest and most comfortable helmet due to its unique suspension system and shock absorbing foam padding that provides very high protection.

- **Combat Helmets** : This composite helmet is very cost effective as its special design and accessories allow one size to fit all. It comes with a provision for a visor.

- **Anti-Riot Helmets** : This helmet is designed for Law Enforcement Forces. Its outer shell is impact resistance and comes with an unbreakable polycarbonate visor. It protects the head and the face by providing maximum coverage.

- **Crash Helmets** : This helmet safeguards against accidental crashes.

- **Airborne Troops Helmets :** These helmets are made with high pressure compression moulding process used by aircrew in helicopters and other aircrafts. It contains a high impact liner to provide bump protection.

2.8.51 The ballistic helmets are produced by some of the established bullet proof jacket manufacturers i.e. Tata Advance Materials Limited (Bangalore), Anjani Technoplast Limited (Noida), M. Kumar Udyog (Kanpur), Southern Group of Industries (Chennai), etc.

2.8.52 The market for these ballistic helmets is placed around 25,000 to 1,00,000 per annum depending on the annual requirement of the above identified user segments. The price range of these helmets is between Rs.20,000 to Rs.30,000 per piece. Keeping in mind the importance of protective gears, for the Indian Armed Forces and Police, it may be assumed that market will expand by 5 to 10 percent per annum, (say 7.5 percent). Accordingly, the market for ballistic helmets is estimated to increase from 75,000 pieces valued at Rs.187.50 crore in 2003-04 to 1,00,000 pieces valued at Rs.250.00 crore in 2007-08.

2.8.53 Thus the market size for all types of helmets including ballistic helmets is estimated to increase from Rs.233.70 crore in 2003-04 to Rs.317.55 crore by 2007-08.

Headliners :

2.8.54 Headliner is used in all types of passenger cars and multi-utility vehicles as the roofing material and top décor technical textile portion is non-woven (needle punched / stitch bond) / warp knitted technical textile fabric (185 – 220 gsm). For the manufacture of warp knitted technical textile fabrics polyester filament yarn is used, whereas for non-wovens polyester staple fibre is used. Except for luxury

cars the future trend in India would be for non-woven fabrics as a substitute for knitted fabrics which has been the trend world over.

2.8.55 The leading headliner suppliers are Supreme Nonwovens Pvt. Limited (Mumbai), Krishna Maruti Limited (Gurgaon), Multivac India Pvt. Limited (Gurgaon), Group Antolin (Pune).

2.8.56 Future market potential for headliners is linked to the anticipated growth of the passenger car sector which is expected to grow at the rate of 8 percent p.a. Accordingly, market potential for headliners will be as below :

Table 2.3

Market potential for headliners

Year	Car production (lakh numbers)	Requirement of headliners (million sq. mtrs.)	Value (Rs. crore)
2003-04	7.78	1.98	63.30
2007-08	10.57	2.90	92.67

Insulation felts :

2.8.57 Insulation Felts are used extensively for insulation of noise, heat and vibration in automobiles. These are referred to as NVH components. Three types of felts are generally used. Needle-Punched, Phenolic Resin Bonded and Thermoplastic. The felts are used by themselves or in conjuction with a heavy layer of EPDM, EVA or PVC. These may be flat parts or moulded as per the need. These felts are generally made from soft textile wastes or by re-generation of fibres from rags.

2.8.58 Although needle-punched felts could be made on a regular needle-punch line, it is preferable to have a dedicated separate line for this product as such felts are generally made from re-generated textile fibres and the cards would be damaged if line normally required for higher value products made from virgin fibres is used. These felts are loosing their share as they are compact and have high weight as compared to other felts.

2.8.59 Phenolic resin felts are made by blending phenol powder with fibres and forming a thick batt of fibres which is passed through an oven to form a felt of good thickness with low density. Such felts are normally used to make moulded insulation components as the phenol is a thermosetting resin. However, for environmental reasons currently it is being recommended only for engine compartment components.

2.8.60 Thermoplastic felts are produced by blending a small percentage of bonding fibres with the main fibres. The batt produced with the blend of fibres is passed through an oven and a felt of good thickness and low density is produced. The main fibre could be cotton fibre re-generated from rags or polyester. The trend is more towards polyester fibres. This type of felt is a new development and is likely to replace all other felts. Currently, it is used in all areas excluding engine compartment.

2.8.61 The market size currently is around Rs.19.76 crore (mostly needle-felts) but is expected to grow very substantially (around Rs.28.96 crore by 2007-08) as regulations on noise control are being made more stringent. The major producers of felts and NVH components are Supreme-Treves, (Mumbai) and Uniproducts, (Delhi).

2.9 **MEDITECH** :

2.9.1 The scope of meditech embraces all textile materials used in health and hygiene applications in both consumer and medical markets. Depending on the nature of application, many medical products are disposable and made out of nonwoven fabrics.

2.9.2 Textile products are used in medical and healthcare sector in various forms. The complexity of applications has increased with research and developments in the area of medical textiles. The surgical gown, operating room garments and drapes require special antibacterial properties combined with the wearer's comfort. Other major uses of medical textiles are incontinence diapers, sanitary napkins and baby diapers. Wound dressing, bandages and swabs are also widely used conventional medical textiles.

2.9.3 Textiles are also being used as sutures, orthopaedic implants, vascular grafts, artificial ligaments, artificial tendons, heart valves and even as artificial skins. Recent advances in medical textiles to be used as extracorporeal devices are also significant; these include artificial kidney, artificial liver, mechanical lungs etc. New materials are finding specialised applications like antimicrobial and anti-fungal fibres and additives used in barrier fabrics, abdominal post-operative binders, applications in neurodermatitis treatment and various other wound-management and surgical treatments.

2.9.4 Although the type of fibre used and the fabric structure varies with the specific end use, all medical fibres must be non-toxic, non-carcinogenic, non-allergic and capable of being sterilised without suffering chemical or physical damage. In addition, for many applications absorbency is essential, favouring the use of cotton or viscose. In most applications, cotton has been replaced by synthetics such as polyester (because of its durability and low linting characteristics), by polypropylene (the most popular fibre, largely due to its

capillary & inert characteristics), and by viscose rayon (due to its absorbency and biodegradability).

2.9.5 The product-wise market size of meditech segment is indicated in Table- 2.4.

Table – 2.4

Product-wise market size of Meditech segment

(Rs. crore)

Sr. No.	Item	Market size (Estimated)				Market Potential	
		2001-02		2003-04		2007-08 (Projected)	
		Qty.	Value	Qty.	Value	Qty.	Value
1.	Sanitary Napkins	959.69 mn. nos.	335.89	1228.11 mn nos	429.84	1997.44 mn.nos	699.10
	Nonwoven fabric (TTC)	718.81 tonnes	(8.32)	919.85 tonnes	(10.62)	1496.08 tonnes	(17.27)
2.	Incontinence Diapers	3.50 mn. nos.	20.00	8.99 mn.nos	53.96	22.51 mn.nos	135.07
	Nonwoven fabric (TTC)	32.97 tonnes	(0.36)	84.71 tonnes	(0.93)	212.07 tonnes	(2.33)
3.	Baby Diapers	53.85 mn. nos	70.00	61.65 mn nos	80.14	80.81 mn.nos	105.05
	Nonwoven fabric (TTC)	161.55 tonnes	(1.78)	184.95 tonnes	(2.03)	242.43 tonnes	(2.67)
4.	Surgical Dressings (100 % TTC)	-	450.00	-	520.03	-	694.48
5.	Healthcare Textiles (100 % TTC) (Spunbond / Spunlace)	-	3.20	-	11.15	-	120.24
6.	Sutures (100 % TTC)	-	225.00	-	282.00	-	441.00
7.	Vascular grafts (100 % TTC)	-	3.00	-	3.19	-	3.59
8.	Heart valves (100 % TTC)	-	49.00	-	56.00	-	73.00
9.	Artificial tendon (Mesh) (100 % TTC)	-	20.00	-	25.00	-	37.00
10.	Artificial joints (100 % TTC)	-	7.20	-	9.00	-	14.21
11.	Artificial kidney (100 % TTC)	-	10.00	-	13.00	-	17.00
	Total (TTC)		**1193.29 (777.86)**		**1483.31 (932.95)**		**2339.74 (1422.79)**

TTC – Technical textile component.

Sanitary napkins :

2.9.6 Sanitary napkins are absorbent disposable single use products designed to receive, absorb and retain body fluids. In the sanitary napkins, non-woven is

generally used which is normally made up of polypropylene. However, a combination of viscose and polypropylene is also gaining acceptance. Some of the premium brands of sanitary napkins have also started using plastic films instead of non-wovens. Sanitary napkins are covered under BIS No. IS : 5405.

2.9.7 The sanitary napkin industry in India is characterised by the existence of a few well known global brands (i.e., Johnson and Johnson, Procter & Gamble, Kimberly Clark etc.) accounting for 80-85 percent of the market and remaining market is accounted for by a few units in the decentralized sector.

2.9.8 Some of these Multi-National Companies (MNCs) import the napkins from their parent company situated abroad and then sell them in the Indian market after repacking them in smaller packet sizes.

2.9.9 Sanitary napkins have highly promising market potential provided there is extensive promotional activity, advertising and publicity through the print and electronic media.

2.9.10 The assessed requirement of non-wovens for sanitary napkins is around 920 tonnes per annum and the bulk of the requirement is met through imports and a few local suppliers also provide the nonwoven fabrics.

2.9.11 An all out effort also needs to be made to make this product available at affordable price to Indian consumers. This may require setting up of economic size nonwoven fabric (spunbond with Minimum economic size: 690 kg/hour and thermal bond with Minimum economic size: 200 kg /hour) manufacturing units to meet specific requirement of the MNCs.

2.9.12 Survey has revealed that Indian market for sanitary napkins shows immense future potential. The market size of sanitary napkins is estimated to increase from 1228 mn. numbers with a value of Rs.420 crore in 2003-04 to 1997.44 mn. numbers with a value of Rs.699 crore in 2007-08. Correspondingly, the nonwoven demand would also grow as follows :

Table 2.5

Market size for nonwovens for manufacture of sanitary napkins

Year	Market size for nonwovens	
	Volume (Tonnes)	Value (Rs. crore)
2001-02	718.81	8.32
2003-04	919.85	10.62
2007-08	1496.08	17.27

2.9.13 The sanitary napkins are reportedly reserved for production by the SSI sector. The cost of core machinery required for production of napkins exceeds the SSI ceiling for investment. Therefore, there is reported to be large scale underinvoicing of machinery to bring the same under SSI limit. SSI reservation prevents setting up of large scale MES units. Therefore, there is strong need to dereserve the sanitary napkins.

Incontinence diapers :

2.9.14 Incontinence diapers are absorbent, disposable single use product designed to receive, absorb and retain body fluids. The use of incontinence diapers is hygienic as the diapers prevent fungal infection of the skin since the aggressive substance present in the urine does not come in contact with the skin.

2.9.15 The diapers are made up of cellulose and super absorbent materials and cotton having polyester sheet covering. The key performance parameters for incontinence diapers are similar to the other categories of absorbent hygiene products, viz., high absorption capacity and skin dryness; reduced odour; protection from leakage; maximising user comfort, particularly when saturated with liquid and; simple to use.

2.9.16 The end user segment for diapers are senior citizens and hospitals, mostly the people above 75 years of age suffering from incontinence.

2.9.17 The present level of awareness about the product is low even in the metro cities and high-income groups. Further, the price (Rs.45 – Rs.80 per diaper) is also on higher side. On account of high price structure and lack of awareness, this product has not penetrated significantly in the target customer segment even in the metro cities / hospitals.

2.9.18 The incontinence diapers market is dominated by a few MNCs which are primarily engaged in bulk import and repacking.

2.9.19 The Indian market of incontinence diapers is estimated to be about Rs.54 crore and total consumption of nonwoven fabrics by this segment would be around 85 tonnes. However, since all the major players are presently engaged in bulk imports and repacking, the nonwoven fabrics are not sourced locally.

2.9.20 The diapers are currently imported and in view of the high customs duty of 20 percent, the cost for the customer is rather high. In view of the product being consumed by the senior citizens, and hospitals the produce should be made duty free. This would certainly increase the product demand and the market size.

2.9.21 With growing awareness the demand is estimated to increase from 9 mn pieces with a value of Rs.54 crore in 2003-04 to 22.51 mn. pieces with a value of

Rs.135 crore in 2007-08. Accordingly, the requirement of nonwovens would also increase as follows:

Table 2.6

Market size for nonwovens for manufacturing incontinence diapers

Year	Market size for nonwovens	
	Volume (Tonnes)	Value (Rs. crore)
2001-02	32.97	0.36
2003-04	84.71	0.93
2007-08	212.07	2.33

2.9.22 The incontinence diapers are reportedly reserved for production by the SSI sector. The cost of core machinery required for production of incontinence diapers exceeds the SSI ceiling for investment. Thus, SSI reservation prevents setting up of large scale MES units. Therefore, there is strong need to dereserve the incontinence diapers.

Baby diapers :

2.9.23 Baby diapers also come under the disposable category and the properties required in diapers are liquid strike through, liquid acquisition, liquid distribution, liquid storage, liquid barrier, surface dryness etc.

2.9.24 World over, disposable diaper market penetration is very high, particularly in advanced countries. However, the use of this product has been limited in India compared to the washable terry towel diapers. But, the situation has been changing very rapidly in the recent years. The growing Indian economy means lot many people with higher disposable incomes. These people understanding the importance of hygiene and advantages of disposable nappys, have taken to the product in a significant way.

2.9.25 The number of working women in the total work force is increasing. The number of double income families is increasing correspondingly. The number of double income families with higher disposable income have a positive impact on the market. The market is expected to increase from Rs.80.14 crore in 2003-04 to Rs.105.05 crore in 2007-08 accordingly, the requirement of nonwovens would also increase as follows:

Table 2.7

Market size for nonwovens for manufacturing baby diapers

Year	Market size for nonwovens	
	Volume (Tonnes)	Value (Rs. crore)
2001-02	161.55	1.78
2003-04	184.95	2.03
2007-08	242.43	2.67

2.9.26 The baby diapers are reportedly reserved for production by the SSI sector. The cost of core machinery required for production of baby diapers exceeds the SSI ceiling for investment. Thus, SSI reservation prevents setting up of large scale MES units. Therefore, there is strong need to dereserve the baby diapers.

Surgical dressings :

2.9.27 Surgical dressings include wound care products and bandages. Wound care products include wound contact layer / absorbent pad / base material / non-adherent dressings / perforated films, while bandages include inelastic bandages / elastic bandages / light support bandages / orthopedic cushion bandages / plasters / waddings / guazes / lint.

2.9.28 Wound healing is a dynamic process and the requirements of dressing change as the wound healing progresses and no single dressing is universally available for all types of wounds.

2.9.29 Wound dressings were some of the earliest forms of medical textiles and lately have witnessed rapid developments. Wound healing depends not only on medication but also on the use of a proper dressing technique and suitable dressing material.

2.9.30 The prerequisite of wound dressings are ease of application, good padding characteristics, non-sticking nature to the wound and painlessness on removal, creation of an optimal environment for wound healing, softness, pliability, high absorbency, etc.

2.9.31 Modern wound dressings are composed of absorbent layers held between the wound contact layer and a base material. The wound contact layer (primary dressing) is generally placed directly over the wound and covered with an absorbent pad and the whole dressing retained with a base material. The wound contact layer has low adherency and can be easily removed without disturbing new tissue growth. The wound contact layer made of silk, polyamide, viscose, polyethylene is of woven or nonwoven material. The absorbent layer (pad) is of non-woven type, made of cotton, viscose, acrylic etc. Viscose helps to absorb the fluid while acrylic helps to maintain the thickness of pad even after absorbing the fluids. The base material is non-woven or woven type made of viscose or is a plastic film.

2.9.32 Absorbent pads are also available as individual single use items. They are cotton pads covered with a guaze cloth.

2.9.33 Non-adherent dressings are applied to avoid adhesion when dealing with large area wounds such as burns and skin grafts. They are paraffin guaze dressings having a soft paraffin base. These dressings are also medicated with an antibiotic or any topical antiseptic.

2.9.34 Perforated films are porous polyester films used for rapid dressing of surgical incisions.

2.9.35 Bandages can be used for many purposes like support, dressing retention and compression.

2.9.36 Elastic bandages are cotton crape bandages consisting of high twist yarn imparting the necessary elasticity and used in treating vericose veins. Inelastic bandages are medicated cloth bandages. These two bandages are grouped together as adhesive bandages and they have a layer of adhesive impregnated on the cloth layer.

2.9.37 Orthopedic cushions are made of cotton and synthetics. These bandages retain their cushioning effect in the moist atmosphere between skin and plaster. The plaster of paris bandages are made of cotton gauze material of leno weave cloth. The interlocking thread is impregnated in the plaster of paris solution and dried to get the bandages.

2.9.38 Traditionally cotton guazes were used for dressing because of their good absorption property and softness. Even today hospitals use the gauzes for dressing purposes mostly in layers to form swabs for better and higher absorption.

2.9.39 Lint is used as wipes or swabs for primary cleaning of wounds before applying the dressings.

2.9.40 Waddings are single use cotton pieces in great demand abroad. In India, for clinical practice as well as domestic purpose cotton rolls are preferred, pieces of cotton are removed as and when required. In the foreign countries, sterile single use cotton waddings are highly popular.

2.9.41 There are government established standards for various surgical dressings such as handloom cotton bandage cloth: IS:863, cotton gauze absorbent, non-sterilised: IS:758.

2.9.42 The wound care and wound management industry is distributed between the organised sector represented by few MNCs and the decentalised sector of SSIs

/ cottage industry using obsolete technology, no testing facilities and absence of research and development facilities.

2.9.43 There are no standard testing facilities available at the all India level while these products need to be checked for bio-burden, bio-compatibility and cytotoxicity.

2.9.44 The market size of wound care surgicals in 2001-02 was estimated at around Rs.450 crore with the units concentrated in Delhi, Ichalkaranji, Jalgaon, Meerut, Modinagar, Mumbai, Palghar, Tamilnadu etc.

2.9.45 The institutions / hospitals account for about 60 percent sales of the surgical dressings, while individual and general practitioners account for the remaining 40 percent. Further, bandages account for about 65 percent of the market share and wound care for the remaining 35 percent.

2.9.46 The growth of surgical dressings is estimated to be in the range of 5-10 percent (avg. 7.5 percent), accordingly, market size is expected to increase from Rs.520 crore in 2003-04 to Rs.694.48 crore in 2007-08.

Healthcare textiles:

2.9.47 Healthcare textiles comprise surgical clothing (gowns, caps, masks, uniforms etc.), surgical covers (drapes, covers etc.) and beddings (sheets, blankets, pillow cases etc.). Healthcare textiles can be disposable or non-disposable. In India health care textiles continue to be predominantly non-disposable though in the global markets disposables are fast replacing non-disposable health care textiles.

2.9.48 All over the world, disposable healthcare textiles are replacing non-disposables due to ease of use and hygiene, infection free nature and also being cost effective by eliminating laundering. However, in India the use of non-disposable healthcare textiles is still quite significant, though there is a distinct shift towards use of disposable items. For the disposable healthcare items, polypropylene spunbond is most popular in India due to its low cost. However, in Western countries, spunbond-meltblown-spunbond (SMS) and spunlace are more popular because of their inherent advantages in terms of absorption, breathability etc.

2.9.49 Healthcare textiles which have found acceptance in the Western countries are yet to make inroads in the Indian market in a significant manner due to various factors such as low hygiene awareness, pricing policies of the non-wovens,

disposal problems, and availability of cheap washing facilities favouring reusable cotton garments.

2.9.50 Though the general perception is that reusable healthcare textiles are more expensive, a preliminary calculation done by committee reveals that in some cases disposable healthcare textiles are more cost effective. The details are given below:

Table – 2.8

Cost of caps & masks

	Cost of re-usable		**Cost of disposable**	
	Caps (Rs.)	**Masks (Rs.)**	**Caps (Rs.)**	**Masks (Rs.)**
No. of usage	10	10	**2.00 – 3.00**	**3.00**
Cloth + Stitching (Fixed cost)	35.00	17.50		
Laundry + Sterilisation (Recurring Cost at Rs.1.50 per cycle for 10 cycles)	15.00	15.00		
Total Cost	50.00	32.50		
Cost per Usage	**5.00**	**3.25**		

2.9.51 The growth of healthcare textiles is expected to grow at very high rate over the years with increase in awareness about advantages of its usage coupled with cost effectiveness vis-à-vis reusable healthcare textiles.

2.9.52 The growth of the healthcare textiles is linked to the growth of healthcare sector which is growing at around 13 percent - 16 percent. However, non-woven disposal is expected to register higher growth as it would be penetrating into the share of reusable medical textiles. It is estimated that disposable healthcare textiles would increase from Rs.11 crore in 2003-04 to Rs.120 crore in 2007-08.

Sutures :

2.9.53 Sutures are the simplest example of a textile bio-medical device. Sutures are used for wound closure to close cuts and incisions and thus prevent infection and are an integral part of all operations. In fact no surgery can be performed without the sutures.

2.9.54 Absorbable sutures are ideal for wounds inside the body as they dissolve and get absorbed into the body after the operation.

2.9.55 Absorbable sutures are of two types: **synthetic absorbable sutures** made up of poly glycolic acid (PGA) which are absorbed into the body within 20 days – 90 days and **natural absorbable sutures** made up of mucosa of sheep intestine.

2.9.56 Non-absorbable sutures which are made up of nylon, polypropylene, silk, polyester, and polytetrafluoroethylene (PTFE) are not absorbed into the body and

need to be removed by the surgeon. Non-absorbable sutures are generally used in external applications where they are easily accessible, removal is easy and prolonged high strength is required. Non-absorbable sutures are used for serious and complex wounds, where the need is that stitches should not dissolve fast to give the wound a chance to heal while preventing wound re-opening and scar tissue formation.

2.9.57 The Indian market for sutures is assessed at around Rs.280 crore with absorbable sutures having 60 percent of the share amounting to Rs.168 crore while 40 percent of the share is accounted for by non-absorbable sutures. Further, the market share of non-absorbable sutures produced using silk accounts for 50 percent, nylon 10 percent and the remaining 40 percent by other raw materials.

2.9.58 Indian exports of sutures are mostly to countries like Tunisia, Bangladesh, Indonesia, Netherlands, Philippines etc. The exports have been in the range of Rs.11.15 crore to Rs.17.34 crore during the period 1999-2002. The imports of sutures have been from Denmark, Germany, Korea, USA etc. and were in the range of Rs. 3.39 crore to Rs.6.46 crore during the last three years.

2.9.59 The annual expenditure of hospitals on sutures has been increasing in the range of 10-20 percent per annum on account of increased number of operations being performed and the rise in accident cases. Accordingly, the demand for sutures is expected to grow from Rs.280 crore in 2003-04 to Rs.441 crore in 2007-08.

Medical implants and devices :

2.9.60 Medical implants and devices cover items like cardiovascular implants (vascular grafts, heart valves etc.), soft tissue implants (artificial tendon, artificial skin, artificial ligament, artificial cornea etc.), orthopedic implants (artificial joints) and extra corporeal devices (artificial kidney, artificial liver, mechanical lung, artificial heart etc.).

Vascular grafts :

2.9.61 Vascular grafts are used to treat hindrances to blood flow caused by vascular and other diseases. A vascular graft replaces the damaged artery or create a new artery in order to increase blood flow.

2.9.62 The vascular grafts are sterile and single patient use only. They are of following types: **Polyester grafts** - used to repair thoracic and abdominal occluded arteries, **Dacron grafts** - for aortic surgeries and **polytetrafluoroethylene (PTFE) grafts** - to repair occluded arteries and veins in the hands and feet and for dialysis treatment of chronic renal failure patients.

2.9.63 The vascular grafts marketed in the country are imported by the players like W.L. Gore & Associates, who dominate the market with a share of about 60 percent followed by Edwards Life Sciences, Boston Scientific, Sri Chitra. The price of these grafts is in the range of about Rs.10,000-Rs.20,000 per piece. The prerequisites of good vascular grafts are :

- Bio-compatibility,
- Non-fraying properties,
- Flexibility,
- Durability,
- Resistance to sterilization,
- Bacteria resistance and
- Non-thrombogenicity.

2.9.64 The survey has revealed that the market for vascular grafts would grow at an annul growth rate of about 2 percent - 3 percent. Accordingly, the demand for vascular grafts is estimated to increase from Rs.3.19 crore in 2003-04 to Rs.3.59 crore by 2007-08.

Heart valves :

2.9.65 The heart valves assist cardio-thoracic surgeons in treating valvular diseases. The heart valves are of two types, namely, mechanical valves and tissue valves.

2.9.66 Mechanical valves are used for younger patients and require periodical check-ups and after a particular period, the patients need to be operated a second time. Mechanical valves are made of titanium, around which is a knitted fabric to be stitched to the original tissue called as sewing ring. The sewing ring of the caged-disc type of prostheses uses a silicon-rubber insert under a knitted composite PTFE and polypropylene fibre cloth. The price of mechanical valve is in the range of Rs.30,000 to Rs.50,000 each.

2.9.67 Tissue valves are used for slightly aged patients and do not require any periodic checkups. The life of these valves is 15-20 years and the price is in the range of Rs.45,000 to Rs.65,000 each.

2.9.68 Mechanical and tissue valves are available in sizes ranging from 17 mm to 35 mm. Mechanical valves constitute about 90 percent of the total market while tissue valves account for about 10 percent of the total market.

2.9.69 Indian exports of artificial heart valves have been in the range of Rs. 0.15 crore to Rs.0.72 crore during the last three years. The imports of artificial heart valves have been from Canada, USA, Switzerland, Singapore etc. and were in the range of Rs. 11.54 crore to Rs.23.86 crore during the last three years.

2.9.70 The market size for artificial heart valves is estimated to grow at an average annual growth rate of 7 percent. Accordingly, the future market size of the heart valves would increase from Rs.56 crore in 2003-04 to Rs.73 crore by 2007-08.

Artificial tendon (Mesh) :

2.9.71 The composite meshes made up of polyester, polypropylene and polyester / carbon fibre are used for repairing hernia.

2.9.72 The utilization of mesh grafts in humans for hernia operations is based on the fact that during the absorption period a neomembrane is formed at the site where the mesh has been implanted. The mesh graft prevents recurrence of hernia and hence has an advantage over the tissue repair technique practiced for a long time in India.

2.9.73 The imported meshes are purchased in sterilized packaged form and sold in the Indian market. The existing market size for artificial tendon (mesh) was assessed at about Rs.20 crore in 2001-02.

2.9.74 The market size for artificial tendon (mesh) is estimated to grow at an average annual growth rate of 11 percent. Accordingly, the market size of artificial tendon (mesh) would increase from Rs.25 crore in 2003-04 to Rs.37 crore by 2007-08.

Artificial joints :

2.9.75 The artificial joints are made of stainless steel, chromium cobalt, titanium or some other inert material. The textile material present in the joints is Ultra High Molecular Weight HDPE (UHMWHDPE). Artificial joints are covered under BIS No. IS : 5810. Inor Orthopaedics and Johnson & Johnson are the major players in this market.

2.9.76 The imports of artificial joints have been from Germany, France, Switzerland, USA etc. and were in the range of Rs. 0.59 crore to Rs.4.07 crore during the last three years. Indian exports of artificial joints were in the range of Rs. 1.03 crore to Rs.1.90 crore during the last three years.

2.9.77 The market size for artificial joints is estimated to grow at an annual rate of 12 percent and accordingly, the market size of artificial joints is estimated to increase from Rs.9.00 crore in 2003-04 to Rs.14.21 crore by 2007-08.

Artificial kidney :

2.9.78 Artificial kidney consists of a semi-permeable membrane, on one side of which blood passes while a special dialysate solution is passed along the other. The artificial kidney is made of polyacetate and polysulphone in equal proportions.

2.9.79 The market size for artificial kidneys has been growing at an annual rate of 5 to 10 percent and accordingly, the market size of artificial kidneys is estimated to increase from Rs.13.00 crore in 2003-04 to Rs.17.00 crore by 2007-08.

2.10 **SPORTTECH**:

2.10.1 Due to increasing interest and participation in the sports and leisure activities, the consumption of sports goods and equipment and attendant consumption of textiles in such goods and equipment has shown steady increase.

2.10.2 Applications of textiles for sports and leisure are extremely diverse, ranging from sports foot-wear to artificial turfs to parachute fabrics. For sporttech, synthetic fibres and coating have largely replaced traditional cotton fabrics and other natural fibres. The product-wise market size of products of sporttech is given below:

Table 2.9

Product-wise market size of sporttech segment

(Rs. crore)

Sr. No.	Item	Market size (Estimated)				Market Potential	
		2001-02		2003-04		2007-08 (Projected)	
		Qty.	Value	Qty.	Value	Qty.	Value
1.	Sports footwear	570 Mn. Pairs	5100.00	595 Mn. Pairs	5950.00	804 Mn. Pairs	8040.00
	Footwear Components (TTC)	105 mn mt	(1020.00)	120 mn mt	(1200.00)	140 mn mt	(1600.00)
2.	Sports Composites (100 % TTC)	-	275	-	315	-	415
3.	Sleeping bags (Camping) (100 %TTC)	25000 nos.	6.25	30000 nos.	7.50	50000 nos.	12.50
4.	Artificial Turf (100 %TTC)	-	3.50	-	5.04	-	10.45
5.	Balloning fabrics (100 %TTC)	-	0.50	-	0.61	-	0.89
6.	Parachute Fabrics (100 % TTC)	-	4.50	-	6.00	-	10.67
	TOTAL (TTC)		**5389.75 (1309.75)**		**6284.15 (1534.15)**		**8489.51 (2049.51)**

TTC – Technical textile component.

Sports footwear :

2.10.3 Sports footwear includes appropriate shoes for different sports. Keeping in view the movement of feet and the type of surface on which a sport is played, the shoe's uppers and soles are designed to meet the varying performance requirements.

2.10.4 Textile components form an integral part of sports and sporty look footwear. In terms of value, approximately 20 percent of the components used in sports shoes are textiles, while the remaining cost is contributed by non-textile components such as soles, polyurethane, foam leather on uppers, counters, eyelets etc.

2.10.5 Shoe uppers and lining on the counter, socks below the shoe uppers are made of textiles and constitute nearly 95 percent of the total textiles used in sport shoes. Other textile components, though consumed in minor quantities, are nonwoven textiles, laces, tapes, threads, lables, elastic etc. The shoe uppers and linings used in the inner part counters and socks are made of laminated fabrics. Nonwoven fabrics are used as interlinings. The laminated fabrics for shoe uppers may comprise fabric laminated with foam, polyurethane, rubber etc. In the premium range of shoes, sandwiched meshes may be used instead of fabric-foam laminated uppers.

2.10.6 Three different kinds of fabrics, knitted, woven and non-woven are used for sports shoes. The fibres used for such fabrics are polyester, polyester-viscose, cotton and nylon.

2.10.7 Sandwiched mesh also known as high-tech three dimensional fabrics consisting of micro filaments sandwiched between two layers of meshes is also used as alternative to foam laminated fabrics. Fibres used in these fabrics wick moisture away from the skin to the outer layer of the fabric, thereby facilitating faster evaporation. However, such high performance fabrics are used only in some variants of premium range of sports shoes produced by branded companies.

2.10.8 Polyester, polypropylene, nylon and cotton are used for sporttech. However, the predominant use is that of polyester since it is cheap. Nylon is used for the premium range of shoes. Cotton is used predominantly in canvas shoes and children's shoes.

2.10.9 The Indian sports footwear industry is labour intensive and is concentrated in small and cottage industry sector. Nearly 95 percent of sports

footwear is produced in the small / cottage units concentrated in and around Delhi and mere 5 percent in the organised sector.

2.10.10 Sports shoes are available in a wide variety at prices lower than leather footwear. These shoes are comfortable and can be worn for different purposes such as jogging, casual wear, leisure wear etc. The increasing use of sportswear as leisure wear has also been positively impacting the demand of sports shoes. As a result, the sports footwear industry has witnessed a healthy growth of around 10-15 percent per annum during the last decade and has grown to a 595 mn. pairs of sports shoe market, valued at about Rs.5950 crore. The annual consumption of laminated fabrics by sports footwear industry is about 120 mn. sq. mtrs., and 80 percent of the same is sourced indigenously.

2.10.11 The sports footwear industry is expected to grow by at least 8 percent per annum and accordingly, the demand potential for sports shoes and the attendant requirement of fabrics would be as below :

Table 2.10

Market potential for fabric requirement for sports footwear

Year	Sports shoes		Requirement of fabric (Million meters)
	Million Pairs	Value (Rs. Crore)	
2001-02	570	5100 (1020)	105
2003-04	595	5950 (1200)	120
2007-08	804	8040 (1600)	140

Note : figures in brackets indicate approximate value of technical textile shoe component.

Sports composites :

2.10.12 The Indian sports goods industry manufactures a wide range of sports goods encompassing as much as 318 different items. Textiles are used as raw materials in certain sports items (eg. inflatable balls, cricket protective equipment and boxing equipment etc.) though in extremely small quantities.

2.10.13 Inflatable balls (football, basket ball, volley ball, beach ball, rugby ball etc.) are made of polyester-viscose / polyester / cotton fabric as inner layer and nylon thread which is usually of 9 ply while cotton thread of 5-6 ply are used for stitching.

2.10.14 Protective equipments for cricket comprise leg-guards, batting gloves, wicket keeping gloves, thigh pads, helmets, caps & hats, cricket kit bags etc. Leg-

guards are made of PU laminated / PVC coated fabric in front and cotton fabric on the inner side. Batting gloves are made of PU laminated fabric while wicket keeping gloves are made of PVC coated fabric. However, leather is preferred for manufacture of the best quality cricket gloves due to strength and durability required in these gloves. Thigh pads are entirely made of cotton fabrics on outer and inner side whereas cricket kit bags are made entirely of polyester fabrics.

2.10.15 Boxing equipment (boxing gloves, punch bags etc.) is made of PU laminated / PVC coated fabrics, woven polyester fabric, nylon coated with PVC on both sides and canvas.

2.10.16 PU laminated fabric, PVC coated fabric and polyester used for the manufacture of sports composites are imported fabrics.

2.10.17 The major producers of sports composites are Mayor & Company, (Jalandhar) Cosco (India) Ltd., (New Delhi), Soccer International, (Jalandhar) for inflatable balls and Sanspareils Greenlands Ltd (Meerut), Sareen Spors Industries, (Meerut), Premier Enterprises, (Meerut) B. D. Mahajan (Meerut) for cricket protective equipment and K. L. Mahajan & Sons(Meerut), Beat All Sports (Jalandhar), Hans Raj Mahajan & Sons (Jalandhar) for boxing equipment.

2.10.18 The Indian sports goods industry is highly labour intensive and is largely concentrated in the cottage and small-scale sector.

2.10.19 Indian exports of sports composites were worth about Rs.254 crore in 2001-02, out of which exports of inflatable balls, protective equipment for cricket and boxing related equipment constituted 41 percent (i.e., Rs.105 crore), 10 percent (i.e., Rs.25 crore) and 9 percent (i.e., Rs.23 crore) respectively. Inflatable balls, protective equipment for cricket and boxing related equipment are mainly exported to U.K., South Africa, Canada, Germany, Italy, Australia, New Zealand, USA and Spain etc. The import of inflatable balls, cricket requisites and gloves / mittens for sports in 2001-02 were around Rs.0.62 crore, Rs.0.05 crore and Rs.0.11 crore respectively.

2.10.20 The demand for sports goods is linked to the frequency of tournaments and sports events, popularity of the particular sport, and purchasing power of the buyers. The demand usually picks up significantly when world-cup tournaments or other regional and national sports tournaments are organized.

2.10.21 The market size for selected sports goods using technical textile fabrics is estimated to increase at an annual growth rate of 7 percent and accordingly, the

market potential for sports goods (inflatable balls, cricket protective equipment and boxing equipment) is estimated to increase from Rs.315 crore in 2003-04 to Rs.415 crore by 2007-08.

Sleeping bags :

2.10.22 A sleeping bag may be used in high altitudes with -50^{O}C temperature or in warmer places having temperature in the range of 10^{O}C. Sleeping bags are light-weight and are capable of providing warmth, comfort and protection from wind and water. According to international standards, the maximum permissible total weight of a sleeping bag is around 1.5 kg.

2.10.23 Sleeping bags are constructed with tough yet soft touch nylon taffeta shells filled either with holofil fibre, down feathers, cotton, or polyfill sheet in mummy shape. These fabrics having characteristics of water-repellency, breathability and in the range of 37-120 GSM, are extremely light weight, wind-proof and have very high tear resistance. Sleeping bags produced using synthetic fibre filling constitute 80 percent while remaining 20 percent use cotton filling.

2.10.24 The major users of sleeping bags in India are military forces and para-military forces which account for about 90 percent of the consumption of the total number of sleeping bags produced in India while the other segments comprise corporate sectors, school children going for excursions, mountaineering departments and adventure loving people.

2.10.25 The sleeping bag industry is concentrated in small scale units in the decentralized sector.

2.10.26 Nylon taffeta is one of the major raw material required for producing sleeping bags and its requirement is met entirely through imports from Korea, China, Indonesia, Japan, Sri Lanka, UAE and U.K., etc.

2.10.27 The demand for sleeping bags is linked to adventure loving lifestyle involving active participation in hiking, trekking, income and spending power and awareness about desired product attributes for specific uses. The survey has revealed that television channels such as BBC, Discovery, and National Geographic have definitely propagated adventurous pastimes and created demand for related products. Accordingly, the market potential for sleeping bags is estimated to increase from 30,000 numbers valued at Rs.7.50 crore in 2003-04 to 50,000 numbers valued at Rs.12.50 crore by 2007-08.

Artificial turf :

2.10.28 Artificial turf or synthetic grass consists of pile fibre and backing fabric fabricated from polyester tyre yarn. The pile fibre is made of either nylon 6 or nylon 6.6 or polypropylene / polyethylene which is then custom extruded into a monofilament ribbon form.

2.10.29 The pile fibres are knitted directly into the backing using flat-bed Raschel knitting machines which are between 4.5 m to 5 m wide to form a mechanically strong and stable structure. The sewing threads which are used are high-strength, weather resistant and pigmented to exactly match the color of the turf. The pile fibres are protected by including appropriate organic stabilizers or UV inhibitors and using UV resistant coloring pigments since artificial turfs made of polymeric materials are subject to damage due to exposure to UV radiations present in the sunlight.

2.10.30 Artificial turfs are mostly used in the developed countries for both outdoor fields and portable indoor turf surfaces, including indoor and outdoor arenas, and parks and recreation centers. These synthetic turfs can withstand multi-purpose sports and recreational activities with low maintenance in any kind of weather. However, in India artificial turfs have been used only in hockey pitches.

2.10.31 Artificial turf is not manufactured in India. Imports of artificial turf have been about 84.13 thousand kgs. valued at Rs.3.44 crore in 2001-02 with sourcing from Holland, Germany, Argentina, etc.

2.10.32 The survey has revealed that there is a huge potential for artificial turf in India. The indigenous production of artificial turf would reduce the cost of artificial turf fields making it affordable for every district in every state and major university campuses to have all-year, all-weather artificial turf pitches. Artificial turf systems produced in India could even be exported to Asian and other countries. Accordingly, the market size of artificial turf is estimated to increase from Rs.5.00 crore in 2003-04 to Rs.10.45 crore in 2007-08.

Balloon fabrics :

2.10.33 Balloons include an envelope or fabric portion of the balloon. Depending on the type of balloon there can be a basket made of resilient wicker and enforced with a mesh of steel wire ropes, horizontal and vertical load tapes to reinforce the balloon, steel wire ropes, and altimeter to indicate the altitude, variometer to show whether it is going up or down, compass, temperature gauge and a range of systems and instruments depending on the type of balloon and functions it has to carry out. Buoyancy of the balloon can be achieved either by hot air or gases like

Hydrogen, Helium, Ammonia, and Methane. If the balloon is stationary, it is called aerostat while mobile balloon is termed as airship.

2.10.34 The balloon envelopes are made of special high tenacity fire resistant material called rip-stop nylon 6.6. fabric with tough, durable coatings for heat and air retention. The various performance characteristics needed for hot air balloon fabrics include strength, light-weight, coating, longevity, UV resistance, heat resistance, abrasion resistance and appearance. Besides these critical characteristics, the other qualities required are colour fastness, dye streaks, susceptibility hydrolysis, excessive yarn elongation or stretch, pin-holing or insufficient coatings.

2.10.35 Balloons are used for different applications :

- Advertising
- Sporting and recreational activities
- Tranportation
- Meteorological information.
- Surveillance in defence applications, etc.

2.10.36 Balloon fabrics have been developed in India for DRDO but volumes are insignificant. The survey has revealed that there is only one fabricator of hot air balloons in India, namely, Bandhu Aerospace Pvt. Ltd., Delhi which uses imported fabric from Du Pont, USA and Carrington, U. K.

2.10.37 In adition to defence requirement of balloon fabric, hot air ballooning is an adventure sport in India. The sport needs training facilities, a plain stretch of land where hot air ballooning can be conducted without any interference, a permanent set up so that adventure loving people can come and take a ride. However, in India such supporting infrastructure is not available.

2.10.38 Supporting infrastructure development needs to be initiated by the government so that hot air ballooning could be developed for tourism segment, and for adventure seekers. Amusement parks have pretty big space and adventure cells should be developed in such parks for teaching aerial sports like this.

2.10.39 The growth in hot air ballooning fabrics is estimated to be moderate from Rs.0.61 crore in 2003-04 to Rs. 0.89 crore in 2007-08.

Parachute canopy fabrics and accessories :

2.10.40 Parachutes are used for aerial delivery of men, materials/cargo, heavy equipment, vehicles etc. Besides, they are widely used as air decelerators for

arresting the high speed of fighter aircrafts during landing to reduce wear and tear of the braking mechanism of the aircrafts. Parachutes are also used for accurate bomb dropping, controlled decent of flares etc.

2.10.41 Technical textiles comprise more than 95 percent of most of the parachute systems in the form of canopy fabric, harness, webbing, tapes, rigging lines, sewing, etc. Unlike other conventional applications, fabrics used for canopy of parachutes are essentially required to satisfy certain functional requirements which are of secondary importance in the case of usages like apparel, furnishing, industrial etc. For a fabric to be used as parachute canopy, it has to possess all the basic qualities of a good cloth and in addition, it must behave like an engineering material governed by rigid tolerances in respect of certain parameters which may or may not be important for normal applications. The basic properties of canopy fabric constituting 80 percent of the parachutes, which are most significant to the performance and design of parachutes, are strength, weight and air porosity. These properties are closely inter-related, the change in any of these properties would throw the others out of balance.

2.10.42 Parachute Canopy fabrics and other technical textile accessories are required for following types of parachutes:

- Man carrying parachutes for para troops
- Air crew parachutes
- Heavy dropping parachute systems for dropping vehicles, guns etc.
- Cargo parachute system for supply dropping
- Flare parachutes
- Parachutes for bomb dropping
- Para gliding
- Steerable parachutes
- High altitude parachutes
- Sports parachutes.

2.10.43 Parachute canopy fabrics are woven from high tensile nylon multifilaments in the denier range of 32 to 200 deniers. Cargo parachutes are generally made from cotton fabrics of specific strength. Harness, webbing, tapes etc. are made from high tensile nylon yarn of denier range 210 to 840 denier.

2.10.44 Major consumer of parachutes is Defence Forces. Besides, sports parachutes and para gliding are used in Civil Sector, which is gaining popularity slowly.

2.10.45 It is estimated that Defence requirement for parachute fabrics was Rs. 6 crore during 2003-04 which is expected to increase to Rs.10.67 crore by 2007-08.

2.11 **PROTECH** :

2.11.1 Protech comprises all textile materials and products used in the production of protective clothing of various types. The protective clothing covers garments and accessories intended to protect people from dangerous or hazardous materials, processes or events encountered either during the course of their work or during leisure activities.

2.11.2 The defence is the largest end-user segment of various protective clothing, followed by public utilities personnel like fire service, police, para-military forces, industrial security forces, border security force etc. In view of the latest security situation in India owing to a spurt of terrorist activities and underworld gang warfare, continuing emphasis on safety at work is expected to stimulate demand of protective clothing in many sectors.

2.11.3 In the international technical textile market protech constitutes 5-6 percent of the share while in India, its share is 3 percent. The major products of protech segments are fire retardant textiles, ballistic protective clothing and high visibility clothing. The market size of these items is as follows:

Table 2.11

Product-wise market size of protech segment

(Rs. crore)

Sr. No.	Item	Market size (Estimated)				Market Potential	
		2001-02		2003-04		2007-08 (Projected)	
		Qty.	Value	Qty.	Value	Qty.	Value
1.	Fire Retardant Textiles						
	(A) F.R.Apareals (100 % TTC)	1.00 Mn.	27.50	1.10 Mn.	30.25	1.40 Mn.	38.50
	(B) Speciality F. R. Aperal for Defence (100 % TTC)	50000 Nos	150.00	75000 Nos	225.00	175000 Nos	525.00
	(C) F. R. Upholstry / Furnishing (General public) (100 % TTC)	0.5 Mn. Mt	20.00	1 Mn. Mt.	40.00	5 Mn. Mt.	200.00
	Sub Total F. R.		197.50		295.25		763.50

(Rs. crore)

Sr. No.	Item	Market size (Estimated)				Market Potential	
		2001-02		2003-04		2007-08 (Projected)	
		Qty.	Value	Qty.	Value	Qty.	Value
2.	Ballistic Protective Clothing Bullet Proof Jackets (100 % TTC)	50,000 nos	150.00	75,000 nos.	225.00	1,75,000 nos	525.00
	TOTAL (TTC)		**347.50 (347.50)**		**520.25 (520.25)**		**1288.50 (1288.50)**

TTC – Technical textile component.

Fire retardant textiles:

2.11.4 Protection from heat and flame is the prime requirement of fire retardant textiles for applications in apparels and furnishings. Fire retardant fabrics can be segmented into primary and secondary types. Primary protection clothing is worn for activities where significant exposure to molten substance splash, radiant heat and flames is likely, e.g., steel plant aprons, fire fighter turnout gear and fire entry suits. Secondary protective clothing is designed for continuous protection from possible intermittent exposure to molten substance splash, radiant heat or flame, i.e., continuously worn flame retardant uniforms.

2.11.5 The prerequisites of fire retardant textiles are flame resistance (must not continue to burn); breathability, integrity (fabric should remain intact), insulation (must retard heat transfer), high abrasion resistance, and ease of handling and wearing comfort.

2.11.6 These fabrics are mostly available in woven and knitted form. Fire retardant textiles for furnishing can be used in transportation vehicles (aviation, shipping, railways & automobiles), hotels, hospitals, auditoriums, offices and multi-storied buildings for upholstery, curtains etc.

2.11.7 Dope treated FR polyester has permanent flame retardancy built into its molecular chain. Fire retardant furnishing fabrics use FR fibre (1.3 to 13 dtex) or filament yarn (50 to 3150 dtex). Fire retardant furnishing fabrics are covered under BIS : IS:13501:1992 and IS:11871 : 1986 and IS:12777:1989.

2.11.8 The fire retardant textile industry in India is characterised by the existence of a few well-known global brands and a few units in decentralized sector with presence in the local markets. The major players are Rajasthan Spg. & Wvg. Mills Limited, Bhilwara, Jaya Shree Textiles (Birla Group), Kolkata, Digjam Mills,

Jamnagar, National Woollen Mills, Chandigarh and a few small size mills in Amritsar (Lakhmi, New India / Khurana / India Woollen Mills etc.).

2.11.9 Use of fire retardant textiles can reduce the danger and provide protection to human beings and property. This process has been propelled by public consciousness and legislation in USA and European countries.

2.11.10 The National Building Code of India stipulates compliance with minimum standards for fire safety necessary in the public interest. This is applicable to buildings (or part of buildings) where more than 50 persons, congregate or gather for amusement, recreation, social, religious, civil, travel or similar purposes.

2.11.11 The market potential for fire retardant textiles for apparels including speciality FR for defence and furnishing is estimated to increase from Rs.295.25 in 2003-04 to Rs.763.50 crore in 2007-08.

Ballistic protective clothing :

2.11.12 The aim of ballistic clothing is to prevent bullets or other projectiles or bomb fragments from piercing the body. Ballistic protective clothing has two major user segments, viz., Military and Police for vests and bulletproof jackets.

2.11.13 Ballistic protective clothing is usually made from piles of Para aramid since the combination of high strength, non-flammability and high temperature resistance makes it suitable for ballistic protection in bullet proof vests and jackets. Further, Meta aramid fibres are used for thermal stability since these fibres satisfy the attributes such as high temperature resistance, moderate tenacity and low modulus but excellent heat resistance. A more recent innovation is the use of uni-directional fabrics made from UHMPE (Ultra High Performance Polyethylene) e.g., Dyneena or spectra which have gained commercial success due to their outstanding mechanical properties and are strongest and stiffest on weight basis, offering the highest percentage of absorbed energy versus total impact energy. They are generally lighter in weight than their P-aramid counterpart.

2.11.14 The major players supplying bullet proof jackets / vests are Kusumgar Corporates, Southern Group of Industries, Anjani Technoplast Limited, Tata Advanced Materials Limited, M. Kumar Udyog Limited, etc.

2.11.15 The fabric “Aramid” is imported by the Indian manufacturers for preparing bullet proof jackets / vests. The imported fabric being expensive, increases the cost of the end product.

2.11.16 The survey has revealed that despite uncertainty about the nature of market for bullet proof jackets / vests, the indigenous manufacturers have developed the manufacturing base and have been successful in executing the orders as and when placed by the armed forces or police / para military forces.

2.11.17 The market size for bullet proof jackets / vests is estimated to increase from 75,000 pieces with a value of Rs.225 crore in 2003-04 to 1,75,000 pieces with a value of Rs.525 crore in 2007-08.

High altitude protection clothing :

2.11.18 High altitude protective clothings are used for protection under severe conditions of high wind velocity, varying temperature, high altitude, snow fall, combat effectiveness, etc.

2.11.19 The design of high altitude protective clothing for armed forces needs to meet both functional and comfort properties and systematic approach to arrive at climate – clothing – man relationship.

2.11.20 Protective clothing for Extreme Cold Weather (ECW) comprises jacket, waist coat, trousers, cap glacier, gloves rapelling and gloves glacier.

2.11.21 Protective clothings for ECW are manufactured from low cost PVC or PU coated commodities substrates. Recent years have seen an increase in the use of a new generation of materials at the top end of the market which combine water and wind proofness with breathability, offering new standards in comfort and performance. An even more recent innovation is soft-shell technology, such as Nextec's Epic film, which provides combined water and wind proofness with increased breathability.

2.11.22 Waterproof and breathable fabrics can be produced by using a minoporous or hydrophilic coating or laminate. Microporous coatings or laminates can be produced by mechanical fibrillation, phase separation, solvent extraction or solvent exchange. With the exception of Gore-Tex (PTFE) and Sympatex (polyester), most membranes or coatings are PU-based.

2.11.23 Hydrophobic polyurethane is mainly used as a solid coating and can be applied to a wide base of fabrics including woven nylon and polyester filament, texturised fabrics and microfibre grades. Hydrophobic polyurethane layers can also be applied to microporous films and coatings to seal off the surface pores.

This improves the waterpoof properties without substantially reducing the breathability of the structure.

2.11.24 Defence Research & Development Organisation, Kanpur has developed considerable facilities for design and development of high altitude protective clothing.

High visibility clothing:

2.11.25 High visibility clothing is worn by people working in dark or poorly lit environments where there is a requirement for the wearer to be highly conspicuous. Examples of such end-uses include mining, building and construction, traffic police, airport workers, and staff working near railway lines. This category also includes garments worn in non-vocational activities such as sailing.

2.11.26 Phosphorescent, fluorescent and retro-reflective materials are used in this type of clothing. Phosphorescent materials absorb radiant energy and emit light after the energy source, such as sunlight, is removed. Examples include products produced by GloTech and Beaver Industries. Unlike reflective materials, phosphorescent technology also works underwater.

2.11.27 Fluorscent materials convert energy from non-visible UV rays into visible light. These are useful during daylight but offer little protection in the dark as they do not emit or reflect light. Retro-reflective materials are regarded as the most effective of high visibility materials and take the form of strips, bands or links which may be printed on to garments.

2.11.28 Retro-reflective tapes are based on the principle that if the incident rays of light fall on concave glass, the reflected rays travel back in the same direction. This enhances the visibility of the person wearing garments consisting of retro-reflective tapes. The technology involves coating of highly reflective glass beads with density as much as 50,000 tiny glass beads per square inch.

2.12 **INDUTECH**:

2.12.1 Indutech is one of the important segments of the domestic technical textile industry and contributes about 5 percent to the total technical textile market in the country. The product-wise market size of the inductech segment is given overleaf:

Table 2.12

Product-wise market size of indutech segment

(Rs. crore)

Sr. No.	Item	Market size (Estimated)				Market Potential	
		2001-02		2003-04		2007-08 (Projected)	
		Qty.	Value	Qty.	Value	Qty.	Value
1.	Conveyor belts	19000 tonnes	550.00	21753 tonnes	630.00	28514 tonnes	825.00
	(TTC)	3230 tonnes	(94.00)	3698 tonnes	(110.00)	4847 tonnes	(140.00)
2.	Hoses	-	500.00	-	585.00	-	794.00
	(TTC)	-	(99.00)	-	(116.00)	-	(157.00)
3.	Ropes (100 % TTC)	74000 tonnes	407.00	85000 tonnes	467.00	114160 tonnes	628.00
4.	Drive belts	13081 tonnes	300.00	14422 tonnes	331.00	17530 tonnes	402.00
	(TTC)	2000	(50.00)	2205	(55.00)	2680	(67.00)
5.	Computer Ribbons (100 % TTC)	3.00 mn. Sq. mtrs.	30.00	5.10 mn. sq.mtrs.	51.00	14.50 mn. Sq. mtrs	145.00
6.	Batteries	-	540.00	-	713.00	-	1261.00
	Battery separators (TTC)	8.83 mn. Sq. mtrs.	(23.00)	11.88 mn. Sq. mtrs.	(30.93)	21.63 mn. Sq. mtrs	(56.33)
7.	Filters	-	260.00	-	297.60	-	386.29
	Filtration Media (TTC)	-	(81.00)	-	(95.00)	-	(132.00)
8.	Decatising Cloth (100 % TTC)	10.00 lakh mtrs.	25.00	10.80 lakh mtrs.	27.00	12.60 lakh mtrs.	31.60
9.	Bolting cloth (100 % TTC)	-	10.00		10.00		12.00
	Total (TTC)		**2622.00 (819.00)**		**3111.60 (961.93)**		**4484.89 (1368.93)**

TTC – Technical textile component.

Conveyor Belts :

2.12.2 Conveyor and conveying systems are important subsets of the material handling industry. These play an important role in large manufacturing operations to transport raw materials, intermediate products or finished goods.

2.12.3 Conveyor belts are used in one form or another in every industrial sector / segment. Industry-wise consumption of conveyor belts for the year 2001-02

indicates that cement plants accounted for 27 percent of the consumption followed by coal mines and other mines and minerals at 25 percent, thermal plants, original equipment and system manufacturers at 16 percent each and others (paper / glass/fertilizers/chemicals etc.) at 16 percent.

2.12.4 Conveyor belts are classified as rubber conveyor belts and PVC conveyor belts. Rubber based belting is of two types, viz., textile reinforced and steel reinforced. In textile reinforced belts different textiles like cotton: cotton, cotton: nylon, nylon: nylon, nylon: polyester are used. (Steel reinforced belts are largely used in coal mines). Rubber Conveyor belts are made up of different ingredients such as rubber (50 percent), carbon black (20 percent), fabric (17 percent) and chemicals (13 percent).

2.12.5 The fabric composition in conveyor belts is predominantly synthetics based with (polyester / nylon 6 / nylon 6.6) accounting for 80 percent and cotton at 20 percent.

2.12.6 PVC based conveyor belts are used in conjuction with polyamide reinforcement specially nylon 6 and 6.6. PVC based conveyor belts are used for carrying iron ore, coal, lignite etc. since these belts are having good stability and anti flame properties.

2.12.7 The standard range of width ranges from 500 mm to 2400 mm for conveyor belts. However, mostly conveyor belts are manufactured in steps of 50 mm. Conveyor belt producers follow Indian Standards as well as British and German standards.

2.12.8 Conveyor belts are mainly exported to USA, UK, Germany, Turkey, UAE etc. Indian exports of conveyor belts were around 2000 tonnes valued at Rs.25-26 crore in 2001-02. The imports of conveyor belts were only around 28 tonnes with a value of Rs.70 lakh in 2001-02 with sourcing from countries, like, Japan, Germany, Italy, Korea and Singapore etc.

2.12.9 Future market potential of conveyor belts is linked to new projects likely to be set up or expansion of the existing projects in the areas of mines, minerals & metals, thermal plants, OEM system manufacturers and cement, paper, glass, fertilizer projects etc.

2.12.10 The market for conveyor belts is expected to increase at the rate of 5 - 10 percent per annum (avg. 7 percent) including the replacement market. Accordingly, the market potential for conveyor belts is estimated to increase from

21,753 tonnes with a value of Rs.630 crore in 2003-04 to 28,514 tonnes with a value of Rs.825 crore by 2007-08. Correspondingly, fabric requirement would increase from 3,698 tonnes with a value of Rs.110 crore in 2003-04 to 4,847 tonnes with a value of Rs.140 crore in 2007-08.

Hoses (industrial, fire and automotive) :

2.12.11 A rubber hose is a flexible tube containing lining (or tube), reinforcement and cover. The lining is the conduit for the passage of the material being handled, which is extruded from specially compounded natural or synthetic rubber. The reinforcement provides resistance to pressure and deformation. The number of layers of reinforcement depends on the working pressure of the hose. The cover is made of specially compounded rubber.

2.12.12 The reinforcement of hoses is categorized in two specific categories such as wire reinforced (high tensile steel wire) which are required in applications like pneumatic tool hoses, hydraulic hoses, welding hoses, air break hoses etc. and accounts for about 40 percent of the total production and the other is fabric reinforced which accounts for about 60 percent of the total production of hoses.

2.12.13 The reinforcement materials used in rubber hoses are cotton, nylon, polyester, rayon and steel wire in the form of filament yarn, rods or woven fabric. Cotton constitutes the dominant reinforcement material for all types of hoses, contributing reinforcement in about 50 per cent of the hoses manufactured using fabric reinforcement. The remaining 50 percent share is of manmade fibres (nylon, polyester, rayon etc.).

2.12.14 The Indian manufacturers of hoses follow Indian standards as well as other standards such as DIN, BS, EN and American standards.

2.12.15 As per All India Rubber Industries Association, there are around 150 manufacturers of hoses, of which 22 units are in the organized sector and the remaining in the decentralized sector.

2.12.16 The consumption of fabric reinforced hoses was around 6.5 mn. running meters valued at Rs.240 crore in 2001-02.

2.12.17 The textile reinforced rubber hoses are mainly exported to USA, Singapore, Malaysia, New Zealand, UAE, Saudi Arabia, Australia, Japan and Srilanka. Indian exports of these hoses were around 2114 tonnes valued at Rs.23-24 crore in 2001-02. The imports of fabric reinforced rubber hoses were around 1161 tonnes with a value of Rs.45 crore in 2001-02 with sourcing from countries like Hong Kong, Korea, UK, Germany, Switzerland and USA.

2.12.18 Apart from the rubber reinforced hoses, there are two type of fire fighting hoses for which the market size is 8 mn. running meters, or 3480 tonnes valued at Rs.100 crore in 2001-02 such as rubber coated synthetic hoses which accounts for 70 percent of the market size while fully synthetic or cotton hoses account for 30 percent of the market size. There are very few manufacturers for fire fighting hoses in the country.

2.12.19 Future market potential for hoses is linked to the anticipated growth in the OEM market and end user industries such as iron and steel, industrial machinery and machine tools, mining, chemicals, petrochemicals, refineries, power generation and earth moving equipment manufacturers and transport industry.

2.12.20 The market for hoses is estimated to grow at the rate of 8 percent. Accordingly, the market potential is estimated to increase from 17.6 mn. meters with a value of Rs.585 crore in 2003-04 to 23.9 mn. meters with a value of Rs.794 crore by 2007-08.

2.12.21 Accordingly, the demand for fabrics for different type of hoses is estimated below :

Table 2.13

Fabric requirement for different type of hoses

Year	Fabric required			
	Volume (in tonnes)			Value (Rs. Crore)
	Industrial hoses	Fire fighting hoses	Total	
2001-02	3920	3716	7636	99
2003-04	4573	4334	8907	116
2007-08	6221	5897	12118	157

Ropes & Cordages :

2.12.22 Over a period of time, ropes made of synthetic fibre have replaced the ropes made of natural fibre due to their high breaking strength, abrasion resistance, resistance to chemical attack, low water absorption etc.

2.12.23 Ropes are generally available in 3 strand, 4 strand and 8 strand and in coils of standard lengths of 110, 220, 330 & 440 meters. However, custom made package size, length and weight are also manufactured according to specific requirements.

2.12.24 Major applications of ropes in various sectors are : (i) fisheries - (3 strand rope) – for tying nets to the floats catch handling, mooring of trawlers and fishing boats, (ii) Shipping - (8 strand and 3 strand ropes) is the biggest consumer of 8

strand ropes for mooring, towing and anchoring purposes and 3 strand ropes are also required in reasonable quantities for pilot ladders, gangways etc., (iii) Ports - (3 strand and 8 strand) - for towing and mooring purposes for cargo handling, (iv) Electricity Boards - for erecting lamp posts, line stringing and lifting heavy cables etc., (v) Material handling for loading and unloading sugarcane in sugar factories, and material handling operations in engineering and construction industries, (vi) Oil rigs - for mooring and towing of tugs and barges on offshore rigs, (vii) Defence - for securing tents, towing and mooring operations of Navy, and (viii) transport industry - for goods handling and for securing goods on transport trucks.

2.12.25 The superior characteristics of Polypropylene (PP) have made it the most popular substitute for natural fibres for rope making. Apart from ropes made of Polypropylene (PP), High Density Polyethylene (HDPE) ropes are also consumed on a large scale. HDPE ropes match the characteristics of PP ropes in almost all respect except that of high floatability becaue of high density. HDPE ropes are losing out on applications in shipping, ports, oil rigs and fisheries (to a certain extent) since they do not float on water and hence are not suitable for mooring purposes.

2.12.26 Nylon ropes have been replaced to a large extent by PP and HDPE ropes, except in applications where high strength and low weight characteristic is required, i.e., mountaineering, deep sea towing etc.

2.12.27 There are few producers of ropes in the organised sector but predominantly it is produced in the small scale sector located mainly in Gujarat, West Bengal, U.P., Delhi and other States.

2.12.28 Imports of synthetics ropes and cordage have increased from about 130 tonnes in 1994-95 to 206 tonnes in 2001-02. Exports of synthetic ropes and cordage have increased from 4394 tonnes in 1994-95 to 17615 tonnes in 2000-01 registering an annual growth rate of 26 percent.

2.12.29 Future market potential for ropes is linked to the demand from sectors like shipping, ports, fisheries, electricity boards, oil rigs, defence and transport sector.

2.12.30 The overall market for ropes is expected to increase at the rate of 7.5 percent per annum. Accordingly, market potential for ropes would increase from 85,000 tonnes with a value of Rs.467 crore in 2003-04 to 1,14,160 with a value of Rs.628 crore by 2007-08.

Drive Belts :

2.12.31 Drive belt is more commonly known as "fan belt," or "V-belt". V-belt is the rubber belt that drives machines such as alternators, air conditioning compressors, and power steering pumps and water pumps, fans in automobiles and a number of industries.

2.12.32 There are different types of v-belts; some of them are wedge section v-belts; high capacity narrow v-belts; hexagonal v-belts; multi rib poly v-belts; automotive timing belts; auto wrapped belts in wedge and classical types; and variable speed drive belts for two wheeler applications. Generally three types of v-belts are commonly used raw –edged, v-ribbed, and wrapped.

2.12.33 V-belts are reinforced with a number of plies which vary from 3 to 10. Woven fabric or cord that is reinforced as ply in the drive belt is made of polyester, Nylon, and cotton. The manufacturers of drive belts are mostly following Indian standards.

2.12.34 V-belts are predominently used in industries, like paper (printing & packaging, paper conversion), textile industry (textile machinery, textile spinning, texturing, weaving units), chemical and fertilizer industry, steel, engineering, railway industry, pharmaceuticals and cement industry.

2.12.35 The requirement for v-belts is met through both the organized sector and the decentralized sector with each sector supplying about 50 percent of the total requirement.

2.12.36 Drive belts are mainly exported to UAE, USA, Australia, France and Italy. Indian exports of drive belts were around 3135 tonnes per annum valued at Rs.32 crore in 2001-02. The imports of drive belts were at 928 tonnes with a value of Rs.38 crore in 2001-02 with sourcing from countries like Korea, Italy, Germany, Singapore, Japan and Canada etc.

2.12.37 Market potential for v-belts is primarily linked with OEM requirement and replacement market which is supplying to textile industry (textile machinery, textile spinning, texturising, weaving units), chemical and fertilizer industry, engineering and railways, paper (printing & packaging, paper conversion), pharmaceuticals, cement industry, steel industry, etc.

2.12.38 The market for drive belt is expected to register an annual growth rate of 5 percent. Accordingly, the market potential for drive belt is expected to increase

from 14,422 tonnes valued at Rs.331 crore in 2003-04 to 17,530 tonnes valued at Rs.402 crore in 2007-08. Correspondingly, the requirement of fabrics / cords would increase from 2,205 tonnes valued at Rs.55 crore in 2003-04 to 2,680 tonnes valued at Rs.67 crore in 2007-08.

Computer printer ribbon :

2.12.39 There are two terminologies in the market, computer printer ribbon and computer printer refill. Computer printer ribbon is nothing but the cassette made up of ABS (Acrylic butadiene styrene) and inked ribbon fabric, which is fitted in the cassette. Ideally after usage of the product (computer printer ribbon) i.e. when you can't print with the ribbon the whole part should be replaced but generally in the market people change or refill the inked fabric that is also available separately in the market. The separate inked fabric available in the market is called as computer refill.

2.12.40 Printer ribbon is made of fabric manufactured by using 40 and 70 denier nylon 6 or nylon 66 filament yarn having properties such as capillary, ink absorption capacity and strength, slitted to the required size (width, i.e, mostly 25.4 mm, 356 mm, 381 mm) and then inked.

2.12.41 Printer ribbon is used in dot matrix, line printers, drum printers or daisy wheel printers. Dot matrix is mainly used where quality of print is not very important, but ink should not spread as well as duplicate or triplicate prints have to be taken. Mostly dot matrix is used in accounts or in banking (Pass book printer), billing, railway & bus tickets, land records and voucher payments etc. where usage is continuous and heavy.

2.12.42 The manufacturers of printer ribbon are categorized in two categories: manufacturers who ink the fabric as well as produce the cassette and assemble it and then sell it and others who outsource and assemble in the factory and sell the product in their brand name.

2.12.43 Computer printer ribbons are mainly exported to Australia, UK and USA. Indian exports of printer ribbons were very small, to the extent of 1.07 lakh numbers valued at Rs.1.23 crore in 2001-02. The imports of printer ribbons have been 3.05 lakh numbers with a value of Rs.7.85 crore in 2001-02 with sourcing from countries like USA (21 percent), Thailand (20 percent), Singapore (9 percent) and Japan (8 percent).

2.12.44 The demand for computer printer ribbons is linked to the computerization of bank branches, computerized reservation system for railways and state transport undertakings and computerization of revenue departments to issue land records

etc. Further, the demand for printer ribbons or refills depend on the market for dot-matrix printers which accounted for 38 percent of the market share.

2.12.45 The market potential for printer ribbon / refill fabric is estimated to increase from 5.1 mn. sq. mtrs. valued at Rs.51 crore in 2003-04 to 14.5 mn. sq. mtrs. valued at Rs.145 crore in 2007-08.

Battery separators :

2.12.46 Battery separator is one of the major constituents for lead type storage batteries**.** The primary function of a battery separator is to separate the positive and negative plates so as to avoid short-circuiting. The separator placed between positive plate and negative plate provides electrical insulation and physical space for electrolyte but permits ionic conduction through the pores of the separator.

2.12.47 There are two functional aspects of battery separators required for batteries: one is physical (i.e., high porosity, small mean pore diameter, oxidation resistance, puncture resistance, thermal dimensional stability, freedom from harmful chemical contaminants) and the other is electrochemical (i.e., favourable voltage characteristics, retardation of antimony transfer, electrochemical compatibility and prevention of dendrite growth).

2.12.48 In India the storage battery industry started with wooden separators then slowly shifted to PVC but presently the industry is steadily shifting to Polyethylene separators. Glass mat with PVC or polythylene is mostly used in all industrial batteries and in a few cases in automobile batteries depending on the function, customer requirement and price.

2.12.49 Storage battery which is the end user industry of battery separators (and its applications) can be broadly classified as two types, i.e., industrial battery and automotive battery. Industrial batteries (i.e., lead acid battery, Valve Regulated Lead Acid (VRLA) battery and nickel cadmium battery) are used in applications like train lighting, signalling electrifications, UPS & inverters, diesel loco starters, air crafts, electric fork lifts, telecommunications, power stations, operation theatres, computer backups and sub marines, miners cap lamps etc. whereas automotive batteries (start, light and ignition batteries) are used in all two, three and four wheelers.

2.12.50 The market for battery separators is dependent on the total market for storage batteries. The market for storage batteries is around Rs 2000 crore out of which around 70 percent is for automobile batteries and the remaining 30 percent is for industrial batteries. Decentralised sector constitutes 60 percent of the total market size while the organized sector accounts for the remaining 40 percent.

2.12.51 The major producers of batteries in organized sector are : Exide Industries Ltd., (Chennai), Amco, (Bangalore), Kirloskar, (Bangalore), Tudor India, (Sabarkantha), Amara Raja Batteries, (Tirupati).

2.12.52 Normally in Auto Batteries, PVC or Polyethylene type separators are used but in recent years some manufacturers have started using Non - woven micro porous absorbent glass mat with PVC or Polyethylene separators. Glass mat is used mainly in high priced customer specified auto batteries.

2.12.53 The Industrial batteries i.e., VRLA type of batteries are the prominent users of non-woven Glass mat battery separators, since such batteries are used for heavy-duty works. The total market for VRLA batteries comes to Rs 400 crore and these batteries (VRLA) consume non-woven glass mat in the form of separators of around 76,80,000 square meters valued at Rs 23 crore.

2.12.54 The overall market (inclusive of replacement market) for storage batteries is expected to register a growth rate of 10-12 percent per annum. Accordingly, the future market potential for storage batteries is expected to increase from Rs.713 crore in 2003-04 to Rs.1261 crore by 2007-08. Non-woven glass mat for manufacturing storage batteries is estimated to increase at an annual growth rate of 16 percent. Accordingly, the market potential for non-woven glass mat is given below :

Table 2.14

Market potential for nonwoven glass mat

Year	Nonwoven glass mat			
	Volume (Mn sq. mtrs.)			Value (Rs. Crore)
	Automobile batteries	VRLA batteries	Total	
2001-02	1.15	7.68	8.83	23.00
2003-04	1.37	10.51	11.88	30.93
2007-08	1.93	19.70	21.63	56.33

Filters:

2.12.55 The broad category of filters is classified in two groups, i.e., Dry (air/dust) Filters and Wet Filters. The selection criteria for filters is based on flow rate/ capacity, pressure drop required, filtration efficiency / micron rating, moisture conditions, PH value, operating temperature, type of cleaning system, nature of gas / liquid involved etc.

2.12.56 **Dry Filteration**: Air filtration is used to provide clean air by filtering off dust and other suspended particles. Dust filtration is to prevent dust (usually

industrial) to escape outside. These are referred to as Dust Collecters or Pollution Control Filters.

2.12.57 **Air filters** are classified in four types based on their efficiency such as pre-filter (medium efficiency device); fine filter (high efficiency device); super-fine filters (dust spot efficiency of high level) and HEPA (high efficiency particulate) filters.

2.12.58 Major applications of air filters are as follows:

- **Ventilation and air conditioning systems** (domestic, commercial and central air conditioning) - Since air-conditioning systems draw air from the environment they are important areas of air filters. Depending on the end use application the type of filtering media is used which could be non-woven fabric, rubberized coir, glass wool or HEPA Filters.

- **Paint Spray booths** (automobile and consumer durable products) - The air inside the paint shop should be free of dust and other large particulate matters. For these air filters synthetic non-woven fabric is used (and also felt, glass wool, wire mesh etc.).

- **Pharmaceutical sectors** (formulation and basic drugs) - Air filters find usage in pharmaceutical units for filtering the air ofdust particles, in the spray coating plant, and in the tableting section for powder recovery. In addition, several units, especially those manufacturing antibiotics, etc., have sterile areas, which are generally air-conditioned, and have HEPA filters fitted into the air conditioning system. Pleated panel type of filters using synthetic non-woven media may account for about 50-55 percent in value terms the rest being HEPA filters, wire mesh filters, felt filters, etc.

- **Power Generation** - The number and type of air filters and the amount of filter media used in gas turbines varies with the size of the gas turbine. The amount of filter material used for air filters varies according to the shape and design of the filter. Air filters used in gas turbines are mostly imported, the major sources of supply being USA, UK and Germany.

- **Air Compressors** - The air at the intake stage of the compressors has to be filtered to remove dust so as to avoid wear and tear of the compressor chamber components as also to ensure clean outlet air. At the inlet stage of compressor various filters can be used such as

cartridge, panel or pocket type (normally cartridge). These filters are made of wire mesh, paper felt, and synthetic non-woven filter elements.

- **Automobiles** – Engine air in-take filters for automobiles use either treated paper or non-woven filter media. The use of nonwovens is increasing on account of their low pressure drop and high dust bearing capacity.

- **Electronic components / Products** - A variety of materials are used as filter media such as rubberised coir, wire mesh, glass wool, felt as well as synthetic non-woven media in electronic industry.

2.12.59 **Dust Collection / Pollution Control** : This is one of the most important areas of use of technical textiles and with great potential for growth. Tremendous amount of industrial dust escapes into the atmosphere creating very high pollution. There are mandatory regulations on the amount of particulate dust that can be released into the atmosphere and these regulations are now being increasingly enforced. The dust generated from factories such as cement, fertilizers, pesticides, food processing, steel, thermal power plants run on coal etc are trapped in pollution control bag-houses and relatively clean air is released into the atmosphere. Very large number of filter bags are installed in the bag house. All the exhaust air is passed through these bags and the dust collected in these bags is separately disposed off. The filter media could be woven or nonwoven. More Nonwovens are used on account of their higher efficiency with lower pressure drop. As the exhaust can have high temperature, corrosive chemicals, moisture, static charge build-up etc., often the filter media needs to be made with speciality fibres to suit the operating conditions. Filter media/bags with speciality fibres are still largely imported despite indigenous capability. There is need to give import duty concessions for import of speciality fibres to encourage manufacture of the filter media/bags locally.

2.12.60 **Wet Filtration**: In wet filtration filter cloth finds wide use in industries like sugar, soft drinks, pharmaceuticals, paints dyestuffs, vegetable oils, as well as in engineering industries. The filter media could be woven, nonwoven or even paper type made from cellulose pulp or cotton. Currently mostly woven filter cloth is used. However, use of nonwovens is gradually increasing. Non-woven filters are also are used for coolants and cutting oil filtration in all engineering industries.

2.12.61 There are a few manufacturers of filter media in the organized sector. The major manufacturers are Supreme Nonwovens in Nonwovens and Khosla Filters in Wovens.

2.12.62 The major players manufacturing dry and wet filter components/ systems are Thermax Ltd. (Pune), Batliboi Ltd.(Pune), Andrew Yule & Co. Ltd..,(Kalyani,WB), Purolater India Ltd (Gurgaon), Kirloskar Filters Ltd.,(Pune), John Fowler India Ltd.,(Bangalore) etc. Apart from them, there are quite a few small and medium scale manufacturers.

2.12.63 The market for dry and wet filters is linked with the growth of the user segments and accordingly, the market size for dry and wet filters is estimated to increase from Rs.298 crore in 2003-04 to Rs.386 crore by 2007-08. Accordingly, the demand for filtration media would increase from Rs. 95 crore in 2003-04 to Rs.132 crore by 2007-08.

Decatising cloth:

2.12.64 Decatising cloth also called as wrapper cloth is an industrial fabric made from polyester and cotton which finds usage in decatising machines, required for finishing process in the textile mills. The length of the cloth varies according to the size of the decatising machine with a minimum of 300 mtrs to a maximum of 500 mtrs. with thickness of around 4-6 mm.

2.12.65 The requirement of decatising cloth by the industry is entirely met by the existing manufacturers such as Bombay Dyeing Ltd. which constitutes 40 percent of the total market share followed by JKT Fabrics at 20 percent and the remaining being shared by the other producers namely, Noor Textiles and Venus Textiles etc.

2.12.66 The market size for decatising cloth is estimated to increase at an annual growth rate of 3 - 4 percent. Accordingly, the market size for decatising cloth is expected to increase from 10.80 lakh mtrs. valued at Rs.27 crore in 2003-04 to 12.60 lakh mtrs. valued at Rs.31.60 crore by 2007-08. However, the committee feels that the market size will exceed Rs.31.60 crore as projected for the year 2007-08 on account of fact that market size of the textile industry is expected to increase from US$ 36 billion to US$ 85 billion by 2010.

Bolting cloth :

2.12.67 Bolting cloth belongs to the family of industrial woven fabrics, primarily used for screen printing in the textile processing / printing units. Bolting cloth is a commodity product, traditionally manufactured by the industrial fabric producers engaged in items like filter fabric, canvas, tarpaulins etc.

2.12.68 Bolting cloth is made of raw materials like nylon mono-filament yarn, polyester mono-filament yarn and polyester multi-filament yarn. The price of standard bolting cloth (40-150 mesh/inch) is in the range of Rs.20 – Rs.40 per

meter. However, there are high end applications for bolting cloth with a linear mesh count upto 400 lines per inch, which would cost as much as Rs.1000 per meter.

2.12.69 The survey has revealed that the existing production capacity is about 35,000-40,000 meters per month where as the capacity utilization is less than 50 percent.

2.12.70 The manufacturers of bolting cloth are mainly concentrated in Gujarat, particualrly Surat.

2.12.71 Indian exports of bolting cloth were in the range of Rs. 0.84 crore to 1.00 crore and the imports have been in the range of Rs. 3.73 crore to Rs.10.24 crore during the last three years.

2.12.72 The present trend is towards switching over of the technology from screen printing to roller printing. Hence, there may not be any significant increase in the market size of the bolting cloth. Accordingly, the market size for bolting cloth is estimated in the range of Rs.10 crore to Rs.12 crore per annum.

2.13 **GEOTECH**:

2.13.1 The market size of geotextiles is given below:

Table – 2.15

Market size of geotextiles

(Rs. crore)

Projects	Planned Infrastructure Projects (Upto 2007-08)	Market Potential (2001-02 to 2007-08)				
		Qty. (Tonnes)	Value (at 3%)	2001-02	2003-04	2007-08
Total Roads (National Highways, Pradhan Mantri Gram Sadak Yoyana, Expressways, State & District Roads)	144404	333307	4333	75	175	1816
Railways	39457	91076	1184	15	75	400
Pavement Road Network	17500	40384	525	5	25	200
Other Infrastructure Projects	18300	42229	549	5	25	224
Total	**219661**	**506996**	**6591**	**100**	**300**	**2640**

Note : The national highways projects includes golden quadrilateral (completion by 2006-07) and NSEW corridors (scheduled for complention by 2007-08) also The Pradhan Mantri Gram Sadak Yojana. Expressway and the state and district roads will be getting over by 2009-10.

2.13.2 The market size of geogrid is given below:

Table – 2.16

Market size of geogrid

(Rs. crore)

Projects	Planned Infrastructure Projects (Upto 2007-08)	Market Potential (2001-02 to 2007-08)				
		Qty. (Mn. sq. mtr.)	Value (at 3%)	2001-02	2003-04	2007-08
Geogrid	18300	63.90	639	10	50	214

Note : Geogrid projects include irrigation projects (Rs.8500 crore), Coastal protection projects (Rs.1800 crore), flood control projects (Rs.8000 crore) and retaining wall of bridges. The market estimates are done assuming around 100 flyovers would be built in the next 5 years and 2000 road embankments on the NHAI project. (Avg. 4000 sq. mt. per flyover).

2.13.3 Geosynthetics are materials used to offer geo-technical solutions to mainly Civil Engineering problems. Geotextiles are one of the geosynthetic materials used. Geotextiles are used extensively in roads, railway tracks, embankments, water works, soil erosion control, slope stabilization etc

2.13.4 The function of geo-textiles is to provide good separation, filteration, protection, drainage and reinforcement. The selection of geotextiles depend on which of these functional requirements are to be met.

2.13.5 Geotextiles may be woven, knitted or nonwoven. They may be used singly or in conjunction with other geomembranes or geo-grids or geo-nets. Geo-grids and geotextiles are classified as geotextiles.

2.13.6 Polypropylene and polyester are the two common polymeric materials used in the global geotextile market. Geotextiles of jute, coir and some other natural fibres are also used where bio-degrability is a desired property or the functional requirement is for small duration and the subsequent bio-degradation of the geotextile does not affect the construction. Synthetics constitute 95 percent of the market while natural fibres account for about 5 percent.

2.13.7 The jute based geotextiles have very large potential for use in construction of village roads. In fact, a pilot project is under execution with the approval of the Ministry of Textiles and Rural Development in close co-operation with Cetral Road Research Institute (CRRI) under the direction of Jute Manufacturers Development Council (JMDC), Indian Jute Industries Research Association (IJIRA) and industry.

2.13.8 The geotextiles are generally classified by the manufacturing process and are often separated into sub-categories, namely, woven, non-woven and knitted.

However, over the years nonwovens have emerged as the most important of the geotextiles. This is because, in the case of nonwovens, those characteristics which are important in Civil Engineering can be more easily built into the products. The nonwoven geotextiles again are primarily of two types: spunbond and needle-punched.

2.13.9 The principal functions performed by geotextiles are confinement / separation, reinforcement, filtration and drainage and protection. The detailed description of these functions is as under :

Confinement / separation :

(i) Confinement provides a media between the aggregate and the subsoil which absorbs the load in the form of tension and prevents change in alignment of the aggregate. Geotextile economically helps the separation concept of keeping two dissimilar materials apart to maximise the physical attributes of each of those materials. The object of separation by geotextiles is to prevent a well defined material or rich material from penetrating the subgrade or the poor soil. If the separating media of geotextiles is absent, the combined effect of the stone aggregate penetrating the soil subgrade infiltrating decreases the permeability of the aggregate to the point where it cannot adequately transport the water that comes to it.

(ii) Suitable geotextile fabric with good puncture and tear resistance when used as a separator media:

- eliminates the loss of costly aggregate material into subsoil,
- prevents upward pumping of subsoil
- eliminates contamination and
- maintains porosity of different levels.

(iii) For separation purposes, both woven / nonwoven geotextiles may be used.

Reinforcement :

(iv) The purpose of geotextiles in the reinforcement function is to reinforce the weak subgrade or subsoil. It helps to strengthen the soil surface and to increase the soils ability to stay put especially on the slopes. Due to this the slopes are stabilised either permanently or temporarily and creep stops or atleast diminishes. Further, it helps in preventing water from permeating a slope and controlling the amount of infiltration that occurs during various rain events.

(v) Reinforcing aspect of geotextiles can be used for roads, temporary roads, pavements, air strips, stabilised road slopes, retaining walls, containment systems, controlling reflective cracking, fibre or fabric reinforced concrete etc.

(vi) For reinforcement synthetic woven fabric or spunbond is the preferred material where primary requirement is reinforcement. Also it is further enhanced by use of geo-grids or geo-nets.

Filtration:

(vii) The purpose of geotextiles with reference to drainage and filtration is simply to retain soil while allowing the passage of water. When geotextiles are used as drains, the water flow is within the plane of the geotextile itself i.e., they have high lateral permeability. At the same time, geotextiles must possess adequate dimensional stability to retain their thickness under pressure. It has been observed that the life of pavement of highways or air field pavements etc., is greatly influenced by the time for which the water remains under the structural section and its drainage system which is responsible for the removal of free water which is fed directly from the stone base course beneath the structure. Needlepunched nonwoven is the preferred geotextlie for such applications where primary requirement is filteration.

Drainage :

(viii) The use of geotextiles in drainage has made significant strides in changing the conventional procedure of using graded filters. Outstanding advantages of geotextiles in drainage are:

- It eliminates the filter sand with the dual media backfill.
- In some cases, it eliminates the need for perforated pipes.
- In situations where only sand backfill is available, it is possible to wrap the drainage pipe with fabric to act as a screening agent. The fabric, thereby, prevents the sand from entering perforation in the pipe.
- With Geotextiles, trench excavation is considerably reduced.
- Many times the use of geotextiles eliminates the need for trench shoring. Needle-punched nonwoven geotextile is preferred where drainage is the primary functional requirement.

Protection:

(ix) Lining is used for cushioning and protection of membrane used for applications such as land fill and waste containment from puncture or training by

sharp stone or stress. Geotextiles can also be impregnated with polymeric or mineral sealing materials such as bentonite clay to provide flexible barriers to mixture. Usually spunbond or needle-punched nonwovens are preferred for such applications.

(x) Each of these functions calls for highly specific textile performance characteristics. As the functional requirements are to be met over many years of the life of the civil construction, durability is often a very key requirement. Many applications require several of the above functions to be met simultaneously. Further, the cost of the geotechnical solution is also an important factor to be taken into account in evaluating solutions.

2.13.10 Geogrids represent a rapidly growing segment within the geotextiles area. Geogrids are plastics filaments, rovings, tapes etc formed into a very open, gridlike configuration which are having large apertures, unlike a woven, nonwoven or knit textiles.

2.13.11 Geonets constitute another specialized segment within the geosynthetic area. Geonets are usually formed by a continuous extrusion of parallel sets of polymeric ribs at acute angles to one another. When the ribs are opened, relatively large apertures are formed into a netlike configuration. Geonets are made of polypropylene (PP) or Polyethylene (PE).

2.13.12 Geonets are used almost exclusively for their drainage capability for applications like water drainage behind retaining walls, seeping rock slopes, beneath sport fields, building foundations; leachate drainage of landfill side slopes, above landfill liners and surface water drainage within landfill caps.

2.13.13 Geomembrane are essentially impermeable membranes. These are used where the primary function is to have an impervious barrier. However, as the possibility of punctures or tears is high in many areas of use, it is common to protect these membranes by use of geotextiles. Often the geotextiles also perform other functions besides protection of the membrane.

2.13.14 Geomembranes are made from continuous polymeric sheets that are very flexible, but can also be made by impregnation of geotextile with asphalt or elastomer sprays or bitumen composites.

2.13.15 Geomembranes are used in applications such as liners for water canals, waste canals, solid-waste landfills, covers for solid-waste landfills, waterproofing within tunnels, to control odors in landfills, to prevent infiltration of water in sensitive areas, and beneath asphalt overlays as a waterproofing layer.

2.13.16 The consumption of geotextiles in the world markets has grown at a phenomenal pace in recent years. Synthetic materials constitute 95 percent of the total consumption and the natural fibres including jute account for only 5 percent.

2.13.17 In India, geotextiles have been selectively used in road and airport flexible pavements and in overlays. In unpaved roads, introducing a very thin non-woven geotextile is found to be of advantage for soft subgrades primarily through separation and partly through reinforcement. The Central Road Research Institute at New Delhi has taken up studies in rural areas of Gujarat and Maharashtra with black soils. Strips of indigenous bitumen coated non-woven geotextiles have been successfully used in Madurai, Ahmedabad and Chandigarh airports in the runways. Their use is believed to have helped in controlling the cracks. Recently non-woven polypropylene geotextiles have been used in the parallel taxi track of Delhi airport over expansion joints, construction joints and crack surfaces while executing a flexible overlay over distressed rigid pavements.

2.13.18 In the wake of infrastructural development projects in India, big cities are going for flyovers in a big way. The National Integrated Highways Project recently launched by the Prime Minister envisages about 13,000 Kms. of express highways covering the entire country. The Rural Connectivity Project will result in further construction of roads. These projects will lead to a huge demand and consumption of geo-textiles within the country. Proper evaluation of products and knowledge of specifications are important issues to be understood to enable the users to select the right product for a particular end-use. Promotion of use of geotextiles will lead to a vast global market for both domestic and overseas consumption.

2.13.19 Consumption of geotextiles in roads & highways constitutes 85 percent of the total consumption. The major players in India are Garware Wall Ropes for woven and Supreme Nonwovens for needle punch nonwovens.

2.13.20 There is no mandatory regulation in the specifications for roads, bridges, railways, irrigation projects, drainage works, river bank protection etc. Lack of technical awareness about the utility and usefulness of the product coupled with lack of demonstration has severely restricted the use of geotextiles.

2.13.21 The market potential for geotextiles is linked with the various infrastructure projects under implementation or likely to be taken up in future. Realisation of market potential would primarily depend on the changes in infrastructure development project specifications and regulatory framework for mandatory use of geotextiles.

2.13.22 The market for the major infrastructure project groups namely, highways, railways, irrigation projects, coastal protection, flood control expressway projects, PMGSY, pavement overlay and state & district roads calls for an investment of around Rs.2,19,661 crore. The market for geotextiles is expected to be 3 percent

of the infrastructure projects likely to be implemented and accordingly the market potential for geotextiles (including geo-grids) is estimated to increase from Rs.350 crore in 2003-04 to Rs.2854 crore by 2007-08.

2.14 **PACKTECH**:

2.14.1 Pack Tech includes all textile packing material for industrial, agricultural and other goods. It ranges from heavy weight woven fabrics used for bags, sacks, wrappings for textiles bales and carpets etc. to light weight nonwoven used as durable papers, bags for tea and coffee as well as other food and industrial product wrappings.

2.14.2 Textile packing materials are produced by textile forming technologies such as circular weaving, raschel knitting etc. and are sold as fabrics on the roll or are formed directly into shaped bags, flexible intermediate bulk containers etc. The demand for packing material is closely related with economic growth, industrial production and trade as goods are produced and then distributed both locally and internationally. In addition, the adoption of new handling techniques, particularly the use of forklift trucks will determine the selection of packing material.

2.14.3 In the global technical textile market packtech contributes 5 percent while in Indian technical textile industry the share of packtech is about 23 percent making it one of the largest segment of technical textiles. The product-wise market size is given below:

Table 2.17

Product-wise market size of Packtech segment

(Rs. crore)

Sr. No.	Item	Market size (Estimated)				Market Potential	
		2001-02		2003-04		2007-08 (Projected)	
		Qty.	Value	Qty.	Value	Qty.	Value
1.	Polyolefin woven sacks including Flexible Intermediate Bulk Containers (FIBC) (100 % TTC)	4.50 lakh tonnes	2925.00	5.70 lakh tonnes	3705.00	9.10 lakh tonnes	5915.00
2.	Soft Luggage Products	-	450.00	-	600.00	-	1000.00
	(TTC)	5.00 mn. mtr.	(60.00)	7.00 mn. mtr.	(84.00)	11.50 mn. mtr.	(138.00)
3.	Food grade jute bags (EOU) (100 % TTC)	5118 tonnes	17.96	8300 tonnes	29.00	12650 tonnes	44.28

(Rs. crore)

Sr. No.	Item	Market size (Estimated)				Market Potential	
		2001-02		2003-04		2007-08 (Projected)	
		Qty.	Value	Qty.	Value	Qty.	Value
4.	Jute sacks and Hessian (for exports) (100 % TTC)	53700 tonnes	194.72	75000 tonnes	268.00	112000 tonnes	400.00
	Total (TTC)		**3587.68 (3197.68)**		**4602.00 (4086.00)**		**7359.28 (6497.28)**

TTC – Technical textile component.

Polyolefin (HDPE / PP) woven sacks:

2.14.4 Polyolefin (HDPE/PP) woven sacks are versatile packing materials used extensively in the packing of cement, fertilizers, thermo plastic raw materials, food grains, sugar etc. HDPE/PP woven sacks are not only stronger vis-à-vis conventional packing materials but also lighter have minimal seepage and are cheaper compared to other bags. Such bags have also the added advantage of moisture proof quality and are therefore used for packing moisture sensitive goods.

2.14.5 The manufacture of HDPE/PP woven sacks involves manufacture of film, slitting of film into tapes and weaving of tapes into fabrics. The fabrics are coated with LDPE film by extrusion coating and sacks are manufactured out of the HDPE fabric. In order to pack moisture sensitive goods, HDPE woven fabric is coated with LDPE. To maintain the quality of HDPE sacks, the Bureau of Indian Standard has issued specifications for the raw materials as well as for the sacks required for different uses (e.g. IS: 9755 – 1999 for fertilizer).

2.14.6 The first unit in India was established in Bangalore in the year 1968. The industry is mostly in small-scale sector with about 750 units spread all over India. The location of the industry is governed by existence of major user industries like cement, fertilizers etc. and the industry is concentrated in the states of Maharashtra, M. P., Gujarat, Karnataka, Tamilnadu, Rajasthan and Punjab. Most of the units, which are in small scale sector are having installed capacity of around 200 TPA.

2.14.7 Initially, the industry had to struggle for recognition for its products as packaging materials. However, the industry managed to survive by establishing the product as a superior packaging material. The industry made great strides in the 90s and it had reached a stage of maturity and meets the total country's requirement of HDPE/PP woven sacks for the major user industries like cement, fertilizers and food products etc. 31 percent of the market for this product is from

cement industry, 18 percent from fertilizers, 17 percent from food products, 11 percent from petro chemicals, 11 percent for exports and 12 percent for other applications.

2.14.8 The market size for the product in the year 2001-02 was 4.5 lakh tonnes valued at Rs. 2925 crore. Import and Export during the year was 18.1 tonnes and 1535 tonnes respectively. The potential of the industry is linked to the growth of the user industries like cement, fertilizers, chemicals, sugar etc.

2.14.9 The major raw material suppliers like Reliance are aggressively promoting HDPE/PP packaging for the existing as well as new areas. In the packaging sector, HDPE/PP bags will continue to offer promising opportunities for new and existing applications.

2.14.10 The HDPE/PP bags is estimated to grow at 12.5 percent in view of the growth of the user segments and promising opportunities and accordingly the market potential would increase from 5.7 lakh tonnes with a value of Rs.3705 crore in 2003-04 to 9.10 lakh tonnes valued at Rs.5915 crore by 2007-08.

Flexible Intermediate Bulk Containers (FIBC):

2.14.11 Flexible Intermediate Bulk Containers (FIBC) popularly known as **Jumbo Bags belong to the family** of HDPE (High Density Poly Ethylene)/ PP (Polypropylene) packaging. These Jumbo Bags are made from **polypropylene** (U.V. Stabilised) Circular Woven Fabric in widest range of coated/uncoated form with or without liners whereas regular HDPE/PP bags are available for 50 kg packing (e.g. Cement), these **jumbo bags** are supplied for **bulk packaging** in different capacities of 750, 1000, 1500, 2000, 3000 and 4000 kgs. The weight of fabric could vary from 180, 200, 240 to 275 gsm. These jumbo bags can be **used** for the bulk packaging of chemicals, detergents, food products, fertilisers, plastic and resins, cement, minerals, petrochemicals, etc.

2.14.12 Jumbo bags offer the user a wide spectrum of unique **advantages** such as

- No wastage in material handling - both for supplier and consumer.
- Saving in packaging cost, handling cost and labour cost
- Flexible, collapsible and durable
- Light in weight
- Reusable
- Require less space for storage and no need for wooden pallets of special handling equipment
- Protects from moisture and water

- Resistant to chemical and microble attack
- Withstand upto 100^{o}C temperature for filling material
- Pollution free
- Available as per customer design

2.14.13 These jumbo bags were first introduced in the country by Texplast Industries Limited, a Mumbai based company with its plant located at Wada in Maharashtra State. The other well-known supplier of these jumbo bags is TPI India Limited with head office in Mumbai and plant located at Tarapur in Thane District. Jumbo Bags Limited, is a Chennai based company (100% EOU). There are a few other small players.

2.14.14 The market for these FIBC Jumbo bags is around Rs.50 crore in 2003-04 and the market is gradually expanding with greater **awareness** about the benefit of these bags for bulk packaging. The industry is experiencing a growth rate of around 10% per annum and accordingly the likely market potential by 2007-08 is expected to be around Rs.75 crores. The existing players engaged in the manufacture of regular HDPE/PP bags, can diversify into jumbo bags as the market expands.

Soft Luggage :

2.14.15 The luggage industry consists of hard and soft luggage. Hard luggage is made by plastic moulding and are large in size whereas soft luggage as its name indicate is made out of woven fabrics made from nylon or polyester and are generally in the size ranges of 460 mm X 340 mm X 160 mm to 790mm X 620 mm X 280mm. It comprises of totes, duffle and sky bags with wheels and handles. Due to its lightness and flexibility, these are found to be more convenient than hard luggage and it is getting more and more popular.

2.14.16 Synthetic fabrics made out of nylon / polyester filament yarns are the major raw material for this industry. Generally polyester is preferred over nylon because of cost effectiveness. Nylon though expensive is preferred in items where abrasion resistance is critical and nylon products are more durable.

2.14.17 VIP, Samsonite, Aristocrat and Safari are the large units having about 40 percent of the market share. However, the unorganized sector consisting of a large number of small-scale and cottage scale units accounts for about 60 percent of the domestic market for these products. However, the quality of products manufactured in the decentralized sector does not match with the reputed players

in the field. However, such units enjoy cost advantage primarily on account of tax concession.

2.14.18 The market size for soft luggage in the country in the year 2000-01 was estimated to be Rs. 450 crore. Import and export of these products in the year was valued at Rs. 2.70 crore and Rs. 8.30 crore respectively. In view of the growing market and the export prospects, it is expected that soft luggage industry in India is poised for major expansion, thus emerging as manufacturing hub for major global markets. Accordingly, the market for the soft luggage products in the year 2007 – 2008 is estimated at approximately Rs. 1000 crore. Accordingly, the demand for synthetic fabric, the major raw material, will also go up from the current level of 7.0 million mtrs. with a value of Rs.84 crore in 2003-04 to 11.5 million mtrs. valued at Rs.138 crore by 2007 – 2008.

Food Grade Jute Bags:

2.14.19 Indian Jute Industries Research Association (IJIRA) has recently developed food grade jute bags under Rice Bran Oil (RBO) technology which is suitable for packing all types of edible commodities. Such bags have the qualities of condensation absorption and anti slippage enabling products like coffee and cocoa to be stacked in piles as high as 7 metres with reduced risk of any musty taint arising from microbial activity on damp commodity.

2.14.20 The products processed with vegetable oil under this technology meet satisfactorily all the requirements laid down under IJO standard 98/01 in respect of unsapponifiable and paraffin content as well as absence of undesirable odour. The use of such bags is presently confined to packing of cocoa beans, coffee beans and edible shelled nuts in export market. It could profitably be used for packing all edible commodities like foodgrains, ground nuts, oil seeds, potatoes, pulses, spices and host of other products both within India and abroad.

2.14.21 Some of the leading producers of food grade jute bags are Birla Corporation Ltd., Champhadany Industries, Gloster Jute Mills, Hooghly Mills Projects Ltd., Ambica Multifibres Ltd., all located in Kolkata.

2.14.22 A large potential market exists for food grade jute products made in India. Further, export market is also quite good. In the year 2001-02, India exported 5118 MT. of jute bags valued at Rs. 17.96 crore. In view of the recent RBO technology developed by IJIRA and the contemplated market adoption and promotional programmes, the future market potential for these bags is very promising which can be linked to the production trend of the commodities to be

packed. Accordingly, export potential for the product in the year 2007 – 2008 has ben projected at 12650 MT. valued at Rs. 44.28 crore. Ghana, Cameroon, Nigeria, Brazil, USA, Turkey, Argentina, Australia, Japan, Saudi Arabia, etc. are some of the major export markets for these products.

2.14.23 Since such material is purchased in bulk, price is always an important consideration in sale. There is scope for review of export prices of such items. The need will be more pronounced in case of other commodities for which use is only recommended and not mandatory. There should also be incentive for the manufacture of food grade jute products and exporting the same. E.M.A. assistance level for this category may thus be suitably enhanced to maintain the differential with traditional packaging in products. This will afford the exporters an opportunity to pass on the benefit to the buyers and accordingly lower the prices as a market entry measure. A food grade label needs to be devised in consultation with IJIRA or any such organization which distinguishes Indian Food Grade bag manufactured with RBO technology from the other food grade bags.

Jute Sacks and Hessain :

2.14.24 Traditionally Jute sacks and hessain have been an important packaging material for agricultural commodities like cereals, pulses, oilseeds, beverage crops, tobacco, fruits and vegetables etc. Jute and hessain are the most important segments of the jute industries and entire production is consumed in the domestic market as packaging materials.

2.14.25 It has the advantages of allowing air and vapour movement between the packed commodity and surroundings, hygroscopic nature of the fibre prevents condensation resulting in minimization of problems in storage and transportation. Further, jute bags can be staked safely and are not vulnerable to degradation by Ultraviolet rays of sunlight and do not need cover of protective additives (like polypropylene).

2.14.26 Some of the leading manufacturers are Alliance Jute Mills, Birla Corporation, Auckland Jute Ltd., Champdany Industries Ltd., Chariot Company Ltd., Heisting Jute Mills Ltd., Ludlow Jute Mills all located in Kolkatta. The total production of Jute goods is estimated to be 16 lakh MT in the year 2001-2002, out of which jute sacking constitute 65 percent, hessain 17 percent and others 18 percent.

2.14.27 Currently the global market for hessain and sacking is around 1.50 lakh MT each. Bangladesh being the main competitor has a share of around 50 percent

for hessain whereas for sacking it is almost 100 percent. India needs to carry out an aggressive marketing programme to tap the potential of hessain and sacking, against stiff competition from Bangladesh. The export potential for the products in the year 2007-08 is estimated to be 1.12 lakh tonnes valued at Rs. 400 crore. The main market for jute and hessain is Iran, USA, UK, Syria, Belgium, Egypt, Turkey, Sudan, Syria, Iraq, Indonesia, Kenya etc.

2.14.28 Jute packaging material enjoys competitive advantage in several market segments and this fact must be exploited by means of suitable strategies. For this purpose, jute sack producers will have to change their concept of selling sacks as a commodity to "Packaging System" which meets all the needs of a customer. In the export market India is out priced by Bangladesh because of hidden subsidies offered by the government.

2.15 **OEKOTECH**:

Land Fill Waste Management System:

2.15.1 World over Geo-textiles have played an important role in the waste management system to avoid pollution and rehabilitate the dump ground and thereby avoid the shortage for areas to dump the waste. Use of Geotextiles provides a safe reliable and cost effective land fill system. Secure landfills are considered to be the best available technical option for the safe disposal of large quantities of solid waste. Solid waste management has become a major environmental issue in India as well as other countries.

2.15.2 A modern engineering land fills comprise of basal lining system to prevent the contamination of soil, and ground water by pollutants, a capping system to seal the waste when the capacity of the landfill is exhausted, an impervious sealing layer which prevents the entry of pollutants in the ground, a leachate collection system for the collection and transmission of leachates to a collection pit, a secondary leachate collection/leak detection system.

2.15.3 Very few units are engaged in this activity in the country. The Geo-synthetics division of Garware Wall Ropes Ltd. has successfully executed two such projects for Hindustan Zinc Ltd. at Udaipur and Vishakhapatnam on turnkey basis for the solid waste. The investments in the projects was Rs. 7 crore and Rs. 13 crore respectively. Another project was also executed by them for Binani Zinc at Cochin with an investment of above Rs. 4 crore.

2.15.4 Potential of this activity depends upon the policy of the government in regard to disposal of solid waste. Solid waste is collected by the Municipal

authorities and its safe disposal has been a major environmental problem. Solid waste is also generated by the industrial units such as ferrous non-ferrous units and chemical plants. The per capita MSW generated in India ranges from above 100 gms in small town to 500 gms. in large cities. In India these are collected by respective municipalities and transported to disposal sites which are normally low lying areas outside the city. The limited revenues of municipalities make them un-affordable for the treatment and proper disposal of MSW on a scientific way. The in-sanitary methods adopted for disposal of solid waste is therefore, a serious health hazard.

2.15.5 Heightened public awareness regarding the treatment and disposal of MSW is essential for success of such ventures. The concept of land fill waste management should be enforced by the Ministry of Environment and Forest under the Municipal Solid Waste (Management and Handling) Rules, 2000. State level Pollution Control Boards and the Department of Urban Affairs may be required to take initiative in this direction for environment control. There is a need to create awareness and have demonstration of the success stories. It is estimated that approximately 20 million tonnes of solid waste will be generated every year by 2007-08.

2.15.6 The landfill used for muncipal solid waste and industrial hazardous waste projects requires one layer beneath solid waste of the products geomembrane, geosynthetic clay liner and geotextile (non-woven). The second layer is laid after the land fill is fully utilized and the requirement for that layer will be after the life cycle of land fill, i.e., 5 to 10 years. The market potential is given below:

Table 2.18

Market potential of oekotech (landfill)

Projects	Market Potential (2003-04 to 2007-08)		1st layer Value (Rs. crore)					
	Land area (km^2)	Rate (Rs. / m^2)		2003-04	2004-05	2005-06	2006-07	2007-08
Muncipal solid waste	11.83	210	248.67	12.43	24.87	37.30	74.60	99.47
Industrial Hazardous waste	2.15	210	45.24	2.26	4.52	6.79	13.57	18.10
Total	**13.98**	**210**	**293.91**	**14.70**	**29.39**	**44.09**	**88.17**	**117.56**
Cumulative total				**14.70**	**44.09**	**88.18**	**176.35**	**293.91**

Note : The landfill concept using the technical texstiles was launched and implemented in India with effect from 2003-04. Hence the details for 2001-02 not given.

2.15.7 The committee also noted that diversion of land or waste disposal would be physically impossible since areas with the largest concentration of solid waste would also be the areas with serious scarcity of vacant land. Due to scarcity of land the alternative methods of waste disposal will be used like, waste reduction at source, recycling, incineration and combustion, waste to energy projects. These would impede the use of geo-textiles. Financial constraints and lack of knowledge prevent the urban local bodies from delivering and maintaining an efficient waste management system.

2.16 **AGROTECH**:

2.16.1 Applications for technical textiles in the Agrotech sector include all activities concerned with the growing and harvesting of crops and animals. The principal functions of most agricultural textiles relate to the protection of either food produced, animals or land. End-uses range from crop production through forestry and horticulture to animal and poultry rearing and fishing.

2.16.2 The size, growth and character of demand for agrotech products are governed by the complex balance of factors. However, the underlying driving force behind the agrotech sector is need to feed an increasing population.

2.16.3 The items covered under agrotech are fishnets, shade fabrics, mulch mats and woven and nonwoven crop covers. The agrotech is an important segment of the technical textile sector and in the global technical textile market it contributes about 6 percent of the market share, while in Indian technical textile sector contributes about 2 percent. The product-wise market size of the agrotech sector is given below:

Table 2.19

Product-wise market size of the agrotech sector

(Rs. crore)

Sr. No.	Item	Market size (Estimated)				Market Potential	
		2001-02		2003-04		2007-08 (Projected)	
		Qty.	Value	Qty.	Value	Qty.	Value
1.	Fishing nets & Fishline (100 % TTC)	13300 tonnes	226.00	14660 tonnes	249.00	17800 tonnes	302.00
2.	Shade fabrics (100 % TTC)	780 tonnes	9.00	1650 tonnes	20.00	8250 tonnes	99.00
3.	Mulch mat (100 % TTC)	63 tonnes	1.00	105 tonnes	1.56	400 tonnes	5.70
4.	Woven and nonwoven covers for crop (100 % TTC)	2000 tonnes	25.00	2640 tonnes	33.06	4670 tonnes	58.00
	Total (TTC)		**261.00 (261.00)**		**303.56 (303.56)**		**464.70 (464.70)**

TTC – Technical textile component.

Fish Nets:

2.16.4 Fish nets (Fish knitted fabrics) are used for catching fish by fishermen, in fishing boats and fishing trawlers. The mesh size ranges from 10mm to 250 mm for usage in different fishing gears, which in turn depends on the fishing craft used. The yarn used for fishnet manufacture is either nylon mono filament, nylon multi filament or High Density polyethylene. Fish nets are being manufactured by using power driven net making machines in small and medium scale sectors and by hand knitting in the cottage sector.

2.16.5 In India there are 165 units manufacturing fish nets with a total production of 14500 tonnes per annum, consisting of 4900 tonnes of nylon mono filament nets, 5800 tonnes of nylon multi filament nets and 3800 tonnes of HDPE nets. Out of the above, 132 units are located in southern states.

2.16.6 23 units are manufacturing nylon monofilament yarn with an annual production of about 4900 tonnes. Nylon multi filament yarns is manufactured by 95 units and annual production being 4040 tonnes of 210-denier yarn. In addition about 1800 tonnes of imported nylon multi filament yarn was also used. HDPE based fishnet knitted fabrics are used for the fabrication of trawler nets. The mesh sizes are in the range of 14 to 400 mm. The quality of webbing used per net is about 15 to 20 kgs.

2.16.7 The major end user sectors for fishing nets are Fisheries Development Corporations, Fishermen's Cooperatives, Private Sector trawling companies etc. The uneconomic size of the fish net manufacturing units and also limitations on range and type of the production capability does not enable them to sell to the world market. The slow growth of the domestic fishing industry limits the size of their market at home. The domestic off take of fish nets in the country in the year 2001-02 was 13,300 tonnes. A typical fish net manufacturing unit in India on an average manufactures only about 80 tpa whereas world class fish manufacturing units in Thailand produce over 3500 tpa. The only comparable unit in India is Garware Wall Rope which has an installed capacity of 3890 tpa and produced 2546 tones of nettings in 2001-02.

2.16.8 The future market potential for the products is governed by growth in exports of fish, government policies and regulatory measures which would encourage the growth of fishing sectors and tapping export markets. Fisheries Development is a state subject and therefore is the responsibility of state

government. A number of schemes are in operation for encouraging Marine and inland fisheries.

2.16.9 Exports of fishing nets and twine for fishing nets of nylon and other man made fibres in the year 2001-2002 was about 1179.16 tonnes worth Rs. 1878 crore. The major export markets being Kenya, Norway, Sri Lanka and Tanzania, Morocco, Denmark , Mexico, Italy etc. Growth in exports of fish has been 12.6 percent per annum during 1991-92 to 2001-02 period. The growth in exports of fishnets and twine has been 4.7 percent during 1994-95 to 2001-02 period.

2.16.10 It is estimated that, growth in off-take of fish nets/twine would be about 5 percent and market size is expected to increase from 14,660 tonnes valued at Rs.249 crore in 2003-04 to 17,800 tonnes valued at Rs.302 crore in 2007-08.

Shade nets / fabrics:

2.16.11 Shade nets in India are generally made of Polypropylene or HDPE in knitted or woven form. The standard sizes of net available are in widths of 2,3,4 & 8 metres and in length of 50 and 100 metres. The shade percentage provided varies between 25 percent to 90 percent. Some of the major manufacturers of shade fabrics are Rishi Packers Ltd., (Mumbai), Netlon, (Bharuch), Malmo Exim Ltd., (Mumbai), Kwality Nets, (Mumbai), B & V Agro, (Mumbai), Agro Tech (Anand), Sunpac (Tamil Nadu). Except Netlon and Rishi Packers other units are SSI units.

2.16.12 Shade nets are extremely useful in the horticulture sector especially in grape Orchards to prevent fast yellowing of grapes before achieving maturity. Shade nets are also used in floriculture units and even in sericulture. The states where usage of shade nets is prevalent are Telegaon for floriculture, Tasgaon for grapes, in Maharashtra, Hyderabad in Andhra Pradesh for grapes, Bangalore in Karnataka for sericulture and floriculture, Tuticorin and Chennai in Tamil Nadu for floriculture and Shimla in Himachal Pradesh for apples.

2.16.13 Shade nets are also used in nurseries of tea gardens. These Shade fabrics are used as Anti hail nets by fruit growers in Himachal Pradesh & Kashmir. Shade nets are extensively used in Tea garden nurseries. Potential demand for the products from tea gardens alone could be 750000 sq. mtrs. Shade net of bigger aperture is used as anti hail net. Even though a hail storm may not occur every year, if it does, it can destroy the entire crop.

2.16.14 Shade fabrics are mainly used in green houses / shade houses by exporters of cut flowers and grapes. Hence present usage is still very much limited. Another reason for the limited usage of shade fabrics is the initial cost factor and also lack of knowledge about the products by the cultivators. The farmers have to be educated about the use of shade fabric leading to better crops and higher returns.

2.16.15 Several floriculture and horticulture unit have indicated usage of shade fabrics. Anti-hail nets are being used since 7 to 8 years and are supplied by Rishi Packers, (Mumbai), Netlon, (Bharuch) etc. Total annual off-take is about 200 tonnes. The current demand (2003-2004) for shade fabrics is found to be 1650 tonnes comprising of 1220 tonnes of domestic consumption and 480 tonnes for exports. The market size including export demand for shade fabrics is estimated to grow at least 5 percent per annum over the next five years to touch 8250 tonnes worth about Rs.99 crore by 2007-08.

Mulch Mats :

2.16.16 Mulch mats are used for conserving soil moisture during rainless period and also to suppress weed growth in horticulture applications. Weed control has traditionally been achieved with, bark chips, jute or black plastic sheet which cover the soil, blocking out light and preventing the competitive weed growth around seedlings.

2.16.17 Mulch mat is a generic term used for various types of mulching products. Mulch mats are of three diffent types; woven mulch, non-woven mulch and mulch films. Natual and man-made polymeric fibres or polymers can be used as a base material for mulching products. Depending on the type of raw material it can be further classified in to biodegradable & non-biodegradable mulch mat. Commonly used textile fibres / polymers used are wool, jute, low-density polyethylene (LDPE), high-density polyethylene (HDPE).

2.16.18 Wool fibre is used for designing non-woven mulch mat, LDPE / HDPE polymer is used for mulch films (extruded sheets in different thickness, microns) and fibres like jute, cotton etc. can be used in woven mulch mats.

2.16.19 The wool fibre biodegrades over a one to five year period and gets incorporated into the soil as fertilizer / conditioner for the next crop. Further, wool mulch mats allow water to enter in to the soil (unlike black sheet), and also as a

barrier to prevent excessive soil desiccation during dry period. Wool has better insulation properties under moist condition than LDPE / HDPE mulch films and can prevent seedling damage from ground frost (specially in cold climatic region) thus enabling earlier sowing and a longer growing season. Woven & non-woven mulch mats are generally costlier than the mulch films of LDPE / HDPE.

2.16.20 Since the use of mulch mat leads invariably to better crops, the usage is increasing. Present off take (2002-03) is only 75 tonnes (Rs. 1 crore) however going by the performance of horticulture sector and special emphasis placed on floriculture and Agri Export Zones and comparatively low base, the market size is expected to be 400 tonnes with value of Rs.5.7 crore by 2007-08.

Woven & Non-woven Crop Covers:

2.16.21 Woven crop covers are made of both polyethylene and polypropylene. They come in the form of tough woven semiclean fabric covers. These are used for protecting low growing high value field crops like strawberries, potatoes and lettuce etc. from cold weather night frost, viruses, wind, cold, birds, locusts etc. They allow in sunlight air & water and are used over wire hoops or by itself. These covers last for many growing seasons.

2.16.22 Non-woven crop covers are generally produced using the spun bonding technique. The raw material used is Polypropylene. These non-wovens are both air & water permeable. These can be laid right on the plants unlike plastic covers that can burn any leaves that touch them.

2.16.23 Two units viz., Unimin India Ltd. and PVD Plastmould are manufacturing non-woven spun bond crop covers in India. Both these units are Export Oriented Units and are located at Daman. The production of both units put together in the year 2002-03 was about 4200 tonnes of spunbond nonwoven out of, which 1000 tonnes were sold in the domestic market and 3200 MT inclusive of 2300 MT as crop cover was exported.

2.16.24 The woven crop covers do not find much usage in India since bulk of our agriculture does not have to face frost and pestilence from birds. During 2001-02, about 2000 tonnes were exported for use as crop covers. The growth in export market is estimated to be 15 percent per annum and the expected export potential for the year 2007-08 is estimated to be 4670 tonnes valued at Rs. 58 crore.

Other Agro-tech products:

Bird Protection Nets:

2.16.25 Anti-bird net or bird protection net is an integrally extruded net and is therefore quite expensive. Unlike shade net it is quite stiff and thick. These nets are mostly required to be used in vine yards. This net can also be used in factories where droppings of pigeons create a mess.

2.16.26 Netlon and ARD polymers are the two units manufacturing bird protection net in India. Though, Netlon has been marketing bird protection nets since about 8 years, there has not been much market growth mainly because of high cost. One roll of net cost Rs. 2100 which can cover 625 sq.mtrs. The combined sales of two units is not more than 12 TPA. These nets face competitions from fishnets. The growers mostly buy used fish net, which is sold by weight & is very cheap instead of bird protection net.

Anti – Hail Nets :

2.16.27 Anti-hail nets are being used by fruit growers only in the States of Himachal Pradesh & Kashmir to prevent the crop from hail storms. Even though a hailstorm may not occur every year, if it does it can destroy the entire crop. The government of Kashmir subsidises purchase of anti hail net and helps farmers procure it.

2.16.28 Anti hail nets are manufactured and marketed by Rishi Packers, Netlon etc. for the last 7-8 years. However, the annual off-take is insignificant at about 200 tonnes.

2.17 **CLOTHTECH**:

2.17.1 The clothtech sector cover those textile products which represent functional (and largely hidden) components of clothing such as interlining, sewing thread, shoes laces, zip fasteners and also performance fabrics like umbrella cloth and elastic narrow fabrics etc.

2.17.2 The clothtech is an important segment of the technical textile industry contributing 7 percent to the global technical textile industry. However, in the

Indian context the share of the clothtech was 38 percent during 2003-04. The product-wise market size of clothtech is given below :

Table 2.20

Product-wise market size of the clothtech segment

(Rs. crore)

Sr. No.	Item	Market size (Estimated)				Market Potential	
		2001-02		2003-04		2007-08 (Projected)	
		Qty.	Value	Qty.	Value	Qty.	Value
1.	Shoe laces (100 % TTC)	2469 tonnes	144.00	2721 tonnes	159.00	3308 tonnes	193.00
2.	Sewing threads (100 % TTC)	95000 tonnes	2876.00	125100 tonnes	3788.00	135000 tonnes	4040.00
3.	Interlinings (100 % TTC)	94.20 mn mt	246.00	111.50 mn mt.	290.80	156.17 mn mt.	407.30
4.	Zip Fasteners (100 % TTC)	75 mn mt.	300.00	95.10 mn mt.	380.40	143.50 mn mt.	574.00
5.	Narrow Fabrics (Elastic, Velcro and Labels) (100 % TTC)	-	1820.00	-	2205.00	-	3184.00
6.	Taffeta fabric	490 tonnes	9.13	540 tonnes	10.00	940 tonnes	17.50
	Total (TTC)		**5395.13 (5395.13)**		**6833.20 (6833.20)**		**8415.80 (8415.80)**

TTC – Technical textile component.

Shoe laces:

2.17.3 Shoe laces are manufactured by using cotton, polyester yarn and rarely poly propylene. In cotton common counts used are Ne 6s, Ne 10s, Ne 20s, Ne 40s. The polyester filament yarn used is 300 denier and polypropylene is of 240 denier. Dyed yarns are used for this purpose.

2.17.4 Bata, which is the global brand leader for shoes has established its own captive unit for shoe laces. Other manufacturers numbering around 50 are mostly in the decentralized sector. Agra is the major hub followed by Mumbai, Kanpur, Chennai and Kolkatta. Some of the major players are Indian Shoe lace, Agra, Persic Shoe lace, Agra, Neelam Shoe Lace Industry, Delhi, Hindustan lace Manufacturing, Kolkatta and Paradise Industries, Mumbai. The industry is concentrated where the shoe manufacturing units are located. The installed capacity of the sector is about 4000 Tonnes.

2.17.5 The demand for shoe laces is governed by the number of shoes produced. It also has considerable replacement demand. Out of the 1700 million pairs of foot wear manufactured in India, approximately 30 percent, i.e., 510 million pairs are non leather sporty look shoes. Mostly all these shoes are using laces. 20 percent of the remaining 70 percent includes foot wears requiring laces. Therefore, estimated number of shoes requiring laces are 748 million pairs. Considering 10 percent as replacement market, the estimated market for shoe laces in the year 2001-02 was about 825 million worth Rs. 144 crore per annum at the rate of Rs. 1.75 per pair. Including the other uses in T-shirts, Trousers, Shorts etc. the market size would be of the order of Rs. 150 crore. The industry is expected to grow at 5 percent per annum. The Export of shoes from India is also growing. Considering all this aspects, demand for shoe laces is estimated at 3308 tonnes -valued to the tune of Rs. 193 crore by 2007-08.

Sewing Thread :

2.17.6 Sewing threads have extensive uses and applications for stitching of garments (domestic and export purpose), hosiery, embroidery, leather products manufacturing, bag closer, canvas and tarpaulin etc. Sewing threads are made from natural fibres like cotton or synthetic yarn which is strong, smooth, evenly spun, ply or cable yarn treated by special spinning processors to make it abrasion resistant. Core spun sewing thread, bonded sewing thread and monofilament sewing thread are mostly imported. Sewing thread is required to have the basic properties like high strength and extensibility, uniformity, High luster for good appearance, good dye uptake capacity, nep-free, less hairy, abrasion and heat resistant etc.

2.17.7 The different stages of manufcturing include blending, carding , combing, spinning, twisting, gassing (or singening for synthetic threads), mercerizing, bleaching, glacing, dyeing, drying and lubrication. Sewing threads are generally ply cord or cabled yarns. A ply yarn has two or more single yarns, twisted together, in which two or more threads are first doubled and several of these are doubled then the resultant thread is called cabled yarn or cord.

2.17.8 The sewing thread manufacturing industry in India can broadly be grouped into two major segments viz. the organized mill sector and the decentralized sector / rewinding units. These units together cater to the demands of the numerous user segments, broadly, classified into household and industrial sectors. In the organized sector, Madura Coats Ltd. with 5 manufacturing units spread in different places is the dominant producer followed by Mahavir Mills Ltd.

Rewinding units numbering about 1000 are mostly small scale units purchasing plied or cabled yarn, processing them to convert in to finished sewing thread. Major concentration of rewinders is in and around Mumbai, Nagpur, Amaravati, Pune and Sholapur in Maharashtra as well as in Ahmedabad, Kolkata, Chennai, Tuticorin, Cochin, Coimbatore, Bangalore, Tenali, Hyderabad etc.

2.17.9 The total market for sewing thread has been around 92-95000 tonnes comprising about 70,000 tonnes of cotton and about 20-25000 tonnes of non cotton yarn including the export market of 4685 tonnes. As a household item cotton and polyester thread are consumed by tailors and households for stitching garments. The industrial sector use comprises of manufacture of ready-made garments and hosiery, mechanical bag closing, footwear and leather goods, tarpaulin and canvas stitching, etc. Out of the current market, 60 percent is consumed by industrial sector and 40 percent by household sector.

2.17.10 Future market potential for the product is governed mainly by woven and knitted garment production by the organized sector for domestic and export market as well as by households, tailors etc. The total demand for sewing threads in 2001-02 was placed at 95000 tonnes valued at Rs. 2876 crore which is expected to increase to 135000 tonnes valued at Rs.4040 crore in 2007-08.

Interlining :

2.17.11 Interlining is a woven, nonwoven or knitted fabric used as a lining in garments. Besides giving support and body to the garment, the use of these linings ensures that no wrinkles take place after wash in the cuffs, collars, neck bands, pocket flaps, lapels, coat fronts, chest pieces, tape areas, waist bands etc. which form part of garments like, shirts, suits, trousers, top coats, jackets including sports jacket, ladies jacket, skirts, knit dresses, children's wear, leather garments, footwear etc. and to retain their shape. Interlining fabrics are used to overcome the problems of puckering and shrinkage difference between garments.

2.17.12 Interlining are either basic or fusible. Fusible Interlinings are basic interlinings that are coated with a thermoplastic polymer so that the lining can be bonded to the main fabric by application of heat and pressure. This process known as 'fusing' has led to the development of fusible interlinings which can be easily ironed onto the garment at the required place and due to the bonding no puckering occurs.

2.17.13 A wide variety of methods are employed to produce fusible interlining as per details given overleaf:

(a) In film coatings, a film or foil is applied as it is formed either with broad slot nozzles or with suitable calendar and then permanently fused to the fabric through deflection rollers and a cooling mechanism.

(b) In the spray method hot sealing bonding agent is applied in the form of aqueous dispersion with suitable nozzles which are in turn arranged on mobile slide resulting in distribution or the bonding agent as uniformly as possible on the base, deported with form of small droplets and dried.

(c) In the micro-dot or poly-dot method preheated base cloth is laminated with a specially performed fibrillated net of high density polyethylene by means of a nip roller the resultant laminate is further heated and during the subsequent heating the net structure breakdown and causes small spherical dots to be formed on the fabric.

(d) There are other processes like scatter coating method and powder point method etc. For any bonding process, three variables – temperature, time and pressure are important.

2.17.14 The interlining are produced in the organized sector as well as small scale sector. The demand for interlining clothes is expected to increase substantially as the exports increase post removal of quotas. The total interlining requirement aggregate around 111.50 million meters valued at Rs. 290.80 crore in the year 2003-04 which is expected to increase to 156.17 million meters valued at Rs. 407.30 crore in 2007-08 registering a growth of 9 percent.

Zip fasteners:

2.17.15 Zip fastener or zipper is a fastening device consisting of two parallel teeth stringers, closed or opened by means of a sliding clip pulled between them. Zip fasteners are extensively used in the luggage industries (soft luggage, suitcases, handbags, purses etc.), readymade garments industry (trousers, coats, rain coats, jackets), leather garment and footwear (shoes fitted with open end non metallic zip fasteners, leather utility articles etc.). Zip fasteners are described according to width of the zip elements and in common parlance, however, they are known by their length (viz. 15 cm, 18cm etc.) and size (viz : 3", 4", 5", 8" and 10"). The size of the zipper referred to is the width of the zipper chain.

2.17.16 Zippers can be divided into three major parts – the tape, elements and the slider. Tape is manufactured exclusively for zippers. It is usually made of polyester, but depending on use, synthetic fibre tape, vinyl tape and cotton tape are also used. The portion where the elements are engaged is called the element top. The top is convex and the back is concave. The right and left of this convexity and concavity are engaged and act to fasten the two together. A slider joins or separates the elements when the zipper is opened or closed and consists of a body and a pull-tab. Various types of sliders are available depending on use. Based on material of construction, zippers are primarily divided into two classes viz. Metallic (manufactured out of metals such as brass, steel etc.) and non metallic (manufactured out of plastic). Of the non-metallic zippers, nylon and polyester zippers have achieved greater commercial significance due to their light weight, longer life, corrosion resistance and easy availability in variety of attractive colours. The relevant specifications for manufacture of nylon zippers brought out by the Indian Standard Institution is IS 4829-1968. Nylon and polyester zip fasteners have replaced metallic zip fasteners in readymade garment, luggage segment and leather garment and footwear industries.

2.17.17 In India there are around ten organised units manufacturing zip fasteners. In addition there are a number of small scale units / traders and garment manufacturers who import zip tapes from Taiwan and China. The imports during 2001-2002 was of the order of 2298 tonnes valued at Rs. 45.06 crore. The installed capacity of the industry is 90 mn. meters valued at Rs.350 crore. The total value of indigenous production is estimated to be around 56 mn. meters valued at Rs. 225 crore.

2.17.18 The demand for Zip fasteners is governed by the trend in the production and export of garments, leather utility articles, soft luggage industries, etc. where these products are extensively used. 65 percent of the market is from RMG units (40 percent export and 25 percent domestic) and luggage industry's share is about 30 percent. The production of garments for domestic market is expected to increase by about 15 percent during the next 3 years and 10 percent per annum thereafter. Luggage sector is also growing at the rate of 12 to 15 percent per annum and the leather sector is also growing. Considering the growth of the user industry the demand of zip fasteners is projected at 143.5 million meters valued at Rs. 574 crore during 2007-08.

Narrow Fabrics (Elastic, Rigid Velcro and Labels) :

Elastic Narrow Fabrics :

2.17.19 Elastic Tapes or narrow elastic fabrics consist of an elastomeric yarn (rubber yarn or spandex) interwoven or knitted along with yarn made of cotton, polyester, nylon, viscose or blends thereof. These are extensively used in garments like foundation garments, shorts, jackets, skirts, moulded luggage, sports goods, medical goods, hair bands, baby diapers, sanitary napkin belts, school bag etc.

2.17.20 Elastic tapes can be classified into two types, based on the method of manufacture, viz. knitted and woven elastic tapes. Knitted elastic tape is an interlaced configuration of an elastic thread and yarn, which can be made of cotton, viscose, polyester or combinations thereof. These are characerized by the resilience offered by the knitted structure and the elasticity provided by the elastic material. Woven elastic tapes are characterized by a high degree of resilience and are considered to be superior to knitted elastic tapes and are priced higher. Tapes of widths ranging from 25-35 mm and 8 mm are popular and are largely used in briefs and shorts. The woven elastic tape comprises of a covered rubber thread as the warp and cotton viscose, polyester (or blends thereof) based yarn as the weft. Since most of the units are in small / cottage scale sector, the technology base is very low and the quality of the products manufactured cannot be compared to that of imported from China, Taiwan etc.

2.17.21 Sky industries, Spica Elastic Ltd., Ginza Industries, Straptex India Pvt. Ltd., etc. are the major manufacturers of Elastic Narrow Fabrics among 12 medium / large units. Further, there are 500 SSI / Cottage scale units concentrated around textile / hosiery centres like Mumbai, Surat, Delhi, Ludhiana, Tirupur, Coimbatore etc.

2.17.22 The demand for the products is governed by the production trend in the apparel / garment / foot wear / sport wear / health care medical products industries. During 2001-02 market size for the product was valued at about Rs. 1000 crore comprising of Rs. 970 crores of domestic production and Rs. 30 crores of imports. Considering the growth rate of 10 percent, the market size for the product in the year 2007 – 08 is estimated to be Rs. 1772 crore. Foundation garments account for 60 percent of the consumption of this material, sports wear 20 percent and footwear and other applications 20 percent.

Hook & Loop Tape Fastener – (Velcro – Rigid):

2.17.23 Velcro is also called a Hook and Loop Tape Fastener or Hook and Eyes Tapes is extensively used in garments, footwear, soft luggage, home furnishing, automobile furnishing, health care and medical products etc.

2.17.24 Velcro is made up of two parts hook and loop. Hook and loop fold together to form the completed strap. Velcro is usually woven from 100 percent multi filament and monofilament nylon yarn. Normally, 100, 140, 170, 210, 280, 300, 430 denier yarn is used. SRF, Gujarat Fertilizers, JCT, and Modi are some of the suppliers of nylon yarn to the industry.

2.17.25 Sky Industries, Siddhartha Magic Tapes, Amit Fasterners, Magic Fasteners etc. are the major manufacturers of velcro tapes. The installed capacity of the sector is about 260 mn.mtres. Sky industries holds a market share of 60 percent in the domestic market.

2.17.26 Demand for velcro tapes is governed by the production trend in the user industries like garment, footwear, luggage, home furnishing, health care etc. The domestic production in the year 2000-01 was about 235 mn.mtrs. Annual import of this item is 15 mn. meters. Therefore, the market size during 2001-02 was estimated to be around 250 mn. meters. valued at Rs. 120 crore. Considering a growth rate of 10 percent, the potential market for the product in the year 2007-2008 is estimated to be 314 mn.mtres valued at Rs. 212 crore.

Labels :

2.17.27 The types of labels used are mainly printed and woven which are used in ready-made garments, sports wears, rain wears etc. to identify the manufacturer, the material and size of the products. In the woven variety, there are cotton labels and sophisticated computerized woven labels. Medium and high priced garment manufacturers and exporters mainly use these sophisticated computerized woven labels which are manufactured using taffeta and satin weave using polyester yarn. Printed labels are nothing but printing on different sizes of ribbons or rolls with the help of screen printing technology or offset printing technology.

2.17.28 There are about 10 medium and large-scale units manufacturing labels in India. In addition there are about 30 small-scale units having one to two looms each.

2.17.29 The future market for labels which is inextricably linked to the expansion of ready- made garment, hosiery, sport goods sector is expected to increase at the rate of 10 percent per annum according to the industry sources. Therefore, the

domestic market is expected to increase to Rs. 1200 crore worth of labels in the year 2007-08 from the level of Rs. 700 crore during 2001-02. 67 percent of the current demand is met from the domestic production while 33 percent is met from import mainly from Thailand, Hongkong, Srilanka, Taiwan and Korea.

2.17.30 The market potential for narrow elastic tapes, Velcro and labels put together is estimated to be valued at Rs. 3184 crore.

Taffeta fabric

2.17.31 Taffeta fabrics are used extensively for a large number of applications like umbrella, windcheater, sleeping bags, kites, artificial flowers, substrate for coatings, lining, courier bags etc.

2.17.32 Umbrellas and windcheaters are mainly used during the rainy season. It is also used as a protection from the sun. The estimated market for umbrellas and windcheaters is expected to grow from 6.50 mn. numbers in 2001-02 to about 12.50 mn. numbers by 2007-08 of which the share of umbrellas would be 9.7 mn. numbers and of windcheaters 2.7 mn. numbers. This translates into a total textile requirement of about 540 tonnes valued at Rs.10 crore in 2003-04 and 940 tonnes worth Rs.17.50 crore by 2007-08.

2.17.33 The major users of sleeping bags in India are military and paramilitary forces. In sleeping bags nylon taffeta is used in both outer as well as inner lining. The other segments comprise of corporate sectors, students going for camping and excursions, mountaineering departments and adventure loving people. It is estimated that market size of sleeping bags would be around 50,000 per annum in 2007-08.

2.17.34 These fabrics are made from nylon and polyester filament yarns and internationally accepted as 190T, 210T and 230T material where T indicates the thread density of fabrics.

2.17.35 Presently huge quantity of taffeta fabrics are being imported from China, South Korea, Taiwan, Indonesia because of cost. It is observed that the quality produced in the mills located at Surat is extremely poor as they are produced on shuttle looms.

2.17.36 The project on production of grey taffeta fabrics can contain import and impart self sufficiency to a greater extent for mass consumption product with global quality standard.

2.18 **BUILDTECH**:

2.18.1 Textiles are increasing their market share in construction and architectural application, where their mechanical properties are equal, or often superior to

traditional material. They offer desired characteristics such as lightness, strength and resilience as well as resistance to many factors such as defamation, creep, degradation by chemicals and pollutants in the air, rain or other construction material as well as the effects of sunlight & acid.

2.18.2 The scope of buildtech covers any textiles or composite material used in the construction of permanent and temporary buildings as well as structures. This sector is closely related to but different from geotech which covers application of textiles at or below ground level for purposes such as reinforcement, stabilization and drainage of soil and surface covering.

2.18.3 The major products covered under buildtech are hoardings / signages, scaffoldings net, awnings / canopies, tarpaulins. The products-wise market size is given below:

Table 2.21

Product-wise market size of the buildtech segment

(Rs. crore)

Sr. No.	Item	Market size (Estimated)				Market Potential	
		2001-02		2003-04		2007-08 (Projected)	
		Qty.	Value	Qty.	Value	Qty.	Value
1.	Hoardings / Signages (100 % TTC)	5 mn mt.	50.00	8 mn mt.	80.00	20 mn mt.	200.00
2.	Scaffolding Nets (100 % TTC)	40000 sq. mt.	0.10	53000 sq. mt.	0.13	90000 sq. mt.	0.25
3.	Awnings & canopies (100 % TTC)	45454 sq. mt.	1.00	65909 sq. mt.	1.45	136363 sq. mt.	3.00
4.	Tarpaulins (100% TTC)	-	1000.00	-	1100.00	-	1300.00
	Total (TTC)		**1051.10 (1051.10)**		**1181.58 (1181.58)**		**1503.25 (1503.25)**

TTC – Technical textile component.

Hoardings / Signages :

2.18.4 Usage of flexible-face sign fabric for making hoardings (signage) is a new trend in place of rigid acrylic and polycarbonate sheets, which were predominantly used for making hoardings. There are many benefits of using flexible-face signage and most important is size. Rigid substrates come in fixed maximum lengths, while fabric has no length limitation. As a result, it is possible to produce larger seamless signage. Further, this has the important properties like light transmission, printability, tensile strength, ultra-violet resistance, resistance to ink solvent, boiling water shrinkage, heat sealability, anti mildew, anti-wicking, flame retardant.

2.18.5 Textile sign material, known as flex in trade parlance, is made from PVC coated or laminated polyester warp knit fabric, woven from high tenacity 1000 denier polyester filament yarn. This one-side printable product comprise of 4 layers – base layer of low shrinkable polyester fabric, high polymeric PVC knife coated layer, high polymeric PVC screen coated layer and special anti-UV lacquering layer. The material is surface treated with acrylic finishes to improve the printability for solvent based ink digital printers. The fabric used in front-lit hoardings is available in gsm 280 and 370 and for the backlit in gsm 425 and 540.

2.18.6 The fabric signage weighs less and is easier to handle and transport. The most important benefit of soft signage is its ability to work with a digital printer, which offers flexibility, consistency, and striking photorealistic images. The printed image is identical to the original, especially because colours can be adjusted for an exact match. Using photoshop and other software programs, it is also possible to create unique original graphics or to modify, manipulate, crop and color existing images.

2.18.7 In India, SRF limited and Entremonde Polycoaters have recently started production of signage fabric while Chennai based Texon is also expected to enter into this product line. These companies already have infrastructure for making coated fabrics used in various applications and therefore require only balancing equipment. SRF started production of signage fabrics in Aug., 2002 and produced 15000 sq.mtrs of fabrics during the past financial year.

2.18.8 Outdoor advertising has acquired unprecedented importance in the past few years. The globalization of Indian economy has changed the competitive landscape in the country and with it the extent and quality of outdoor advertising. Telecom services, banking and insurance are some of the sectors that rarely advertised earlier, but have now emerged as big spender on the advertising. Considering the domestic production valued at Rs. 20 crore and import of Rs. 30 crore per annum, the total market for signage fabric was estimated at about 5 million square meters in 2001-02 or Rs. 50 crores in value terms. Of this, 80 percent was for the front-lit fabric and 20 percent for the back-lit fabric. Import was primarily made from Korea. Demand for the fabric is largely concentrated in metros as the 5 metros alone account for 88 percent of the total national demand.

2.18.9 The market for signage fabric is growing at the rate of 20 percent - 30 percent per annum. The factors driving the growth are the recently emerged competition in telecom services, banking, and insurance sectors, entry of organized private sector into retailing and healthcare and most importantly, the technological

superiority of the fabric signage over the conventional materials. The potential market for the product in the year 2007-2008 is estimated to be 20 mn. mtrs. valued at Rs. 200 crore.

Scaffolding Net :

2.18.10 Scaffolding nets are used to cover a building face during construction so as to prevent debris falling on the pavement and causing any damage to personnel and property. These nets are also used for concealing an unsightly appearance of a structure under construction or hiding the façade of a landmark structure before its inauguration.

2.18.11 Scaffolding nets are knitted from HDPE monofilament yarn. UV stabilizers are added to HDPE to develop resistance to UV rays and thus increase the product life. Nets are available in different weights and shading factors, but scaffolding Net of 85 gsm with 75 percent shading factor is a commonly used grade. The properties considered important in the fabric are tensile strength, shading factor and UV resistance. These nets are suitable for outdoor applications and a good quality net has a life up to 7 years provided the atmosphere does not have high content of Sulphur or Halogens.

2.18.12 Netlon, a division of Parry & Co., having manufacturing unit at Vadodara is major producer of scaffolding nets with an installed capacity of 1000 MT per year for all types of HDPE nets used in miscellaneous applications like homes, packaging, construction, bags and agriculture. In small scale sector, scaffolding nets are being made by Elastic Enterprises, Bangalore; Krishna Net, Mumbai; Malmo Net, Mumbai; Sea Fabrics, Ratnagiri and few other companies.

2.18.13 The demand for scaffolding nets is sporadic and the total domestic market was placed at about 40,000 sq.mt. valued at Rs. 10 lakhs per annum during the year 2001-02. The market is stagnant at present but with greater awareness and promotional activity the market for this product is expected to go up atleast by 15-20 percent per annum and accordingly, the market for the product in the year 2007-08 is estimated at 90,000 sq. mtrs. valued at Rs.0.25 crore.

Awnings and Canopies:

2.18.14 An awning is an architectural projection that provides weather protection, identity or decoration and is wholly supported by the building to which it is attached. An awning is comprised of a lightweight, rigid skeleton structure over which a flexible covering is attached. A canopy is also an architectural projection

for a similar purpose but its skeleton structure is supported by at least two stanchions at the outer end. Awnings offer endless possibilities for enhancing a buildings beauty and décor. They add shape, dimension and colour, and can be custom-designed to fit any structure's unique character and style. Awnings also can be stationary or retractable, adorned with graphs and used as signage.

2.18.15 For decades, the choice of awning and canopy fabric was limited to cotton canvas. While cotton offers a great look and feel, it has short life due to weather conditions in outdoor applications. Cotton is therefore being substituted by synthetic fabrics.

2.18.16 In developed countries vinyl-laminated and / or vinyl coated polyester, acrylic, vinyl or resin coated polyester or polyester / cotton, acrylic-painted cotton or polyester / cotton and solution dyed acrylic are used in awning and canopies. Polyester has high strength, quick–drying, wrinkle resistance and crease retention properties. Some vinyl-laminated polyester, fabricated specifically for backlighting, is highly translucent. Vinyl-coated polyester, with the degree of its translucence depending on its colour is primarily used for illuminated awnings.

2.18.17 The base fabric for vinyl coated awning fabric is made out of high tenacity 1000 denier polyester filament yarn and is coated with PVC on one-side or both-sides. The fabric is tested for its breaking strength, tear strength, coating adhesion and water proofing.

2.18.18 SRF Ltd., Entremonde Polycoaters, Aerolux, Décor World etc. are the major manufacturers of awnings & canopies in the country. Annual production of the domestic industry in the year 2001-2002 was about 4545 sq. metres valued at Rs. 0.10 crore. There are about 100 fabricators of awnings at the all India level, of which nearly 35 fabricators are in Delhi alone. Other PVC coated fabrics used in applications like jeep hoods, soft luggage, tents and tarpaulins are also produced by the manufacturers. Of the domestic supply, SRF is reportedly controlling more than 75 percent of the market share.

2.18.19 Awnings are rather expensive, in comparison with canvas or HDPE tarpaulins which are conventionally used in India to protect their premises from sun or rains. Dominance of unorganized awning vendors in the market is also cited as one of the reasons for low penetration and growth rate. The threat from imports is a major cause of concern. The landed cost of fabric imported from China and Korea is working out to be less than the cost of domestic production due to widely

practiced under invoicing. Lack of standardization also a cause for poor demand for the product.

2.18.20 Indian market is still in an early stage of development and the availability of awning fabrics, designs and colours is rather limited here by international standards. Vinyl coated or laminated polyester is the most commonly used awning fabrics in India, followed by limited usage of solution–dyed acrylic fabric. With a blazing sun during the summers and excessive rains during the monsoon, the potential market for awnings in this country is huge. Yet, the demand for awnings is insignificant presently. Around 4000 awning kits are sold per year at all India level at present. Considering the domestic production of Rs. 0.10 crore and import of Rs. 0.90 crore worth of these products during 2001-02, the market was estimated to be Rs. 1 crore worth of these products. Market potential for the products in the year 2007-08 is estimated to be 136363 sq. mtrs. valued at Rs. 3 crores, considering a growth of 20 percent.

Tarpaulins:

2.18.21 Tarpaulins are sheets made out of polyethylene, cotton canvas or some other material used for protecting goods from rain, sun, dust, wind etc. A variety of fabrics viz. cotton canvas, HDPE, jute and coated or laminated polyester fabrics are used in tarpaulins but the cotton canvas and HDPE are the most widely used fabrics. Traditionally, canvas had been the most common technical textile used in manufacturing tarpaulins but lately HDPE woven and laminated fabric and polyethylene sheets have replaced canvas in many applications.

2.18.22 Canvas is made from hard-twisted cotton yarns in 125 to 700 gsm. Low weight fabric of 125-225 gsm is used for the manufacture of shoes, medium weight fabric of 125 to 400 gsm for school bags and medium to high weight fabric from 225 to 700 gsm for the production of tarpaulins for tents and protective coverings.

2.18.23 HDPE tarpaulins are woven from HDPE tapes and are laminated on one or both sides with low density polythene for waterproofing.

2.18.24 High quality tarpaulins are made from polyester fabric coated on one or both sides with PVC. This fabric is generally made in plain weave using polyester filament yarn of 1000 denier.

2.18.25 PVC coated polyester fabric tarpaulins are superior to tarpaulins made from any other base materials, in terms of waterproofing properties, repairability and product life, but their usage is limited because of high initial cost.

2.18.26 Tarpaulins find use in wide variety of applications for protecting goods from rain, sun, dust, and wind. Some of the major applications are : truck and tempo covers; wagon covers; boat covers; industrial / machinery coverings; warehousing and food storage; fumigation covers; agricultural ground sheets; swimming pool covers; construction covers; temporary shelters (tents); lining of pond, reservoir, effluent tank / aqua farm.

2.18.27 The total size of the tarpaulins market is placed at about Rs.1000 crore. According to industry experts, the demand is not growing. The major factor that has contributed to this phenomenon is the product substitution. Till a decade back, canvas tarpaulins covers were used by trucks to cover and protect goods from rains but now canvas has been largely replaced by HDPE sheet covers and HDPE woven and laminated sheets. Similarly, canvas tarpaulin used for protecting grains from moisture in stores and fields has been substituted by plastic sheets. Besides product substitution, the extent of demand is also declining because of developments like containerization, storage silos, etc.

2.18.28 Taking a long term view the market for tarpaulins is expected to grow at a moderate rate and accordingly, the market potential is estimated at Rs.1100 crore in 2003-04 and Rs.1300 crore in 2007-08.

2.19 **HOMETECH**:

2.19.1 Technical textiles and nonwovens play an essential role in the construction of many household textiles, furnishing and floor coverings for domestic consumption and institutional end uses. Applications include fiberfill, carpet backing cloth, stuffed toys, blinds etc.

2.19.2 In the global technical textile market, hometech contributes about 7 percent of the share. However, in India hometech accounts for about 6 percent of the technical textile market. The product-wise market size is given below:

Table 2.22

Product-wise market size of the hometech segment

(Rs. crore)

Sr. No.	Item	Market size (Estimated)				Market Potential	
		2001-02		2003-04		2007-08 (Projected)	
		Qty.	Value	Qty.	Value	Qty.	Value
1.	Fiberfill (including fibre from recycled polymer waste) (100 % TTC)	48000 tonnes	288.00	60000 tonnes	360.00	95000 tonnes	570.00

(Rs. crore)

Sr. No.	Item	Market size (Estimated)				Market Potential	
		2001-02		2003-04		2007-08 (Projected)	
		Qty.	Value	Qty.	Value	Qty.	Value
2.	Jute Carpet Backing Cloth (Exports) (100 % TTC)	2900 tonnes	9.86	9050 tonnes	27.72	13900 tonnes	41.70
3.	Stuffed toys (100 % TTC)	-	60.00	-	66.00	-	96.00
4.	Blinds (100 % TTC)	-	400.00	-	576.00	-	1190.00
	Total (TTC)		**757.86 (757.86)**		**1029.72 (1029.72)**		**1897.70 (1897.70)**

TTC – Technical textile component.

Fiber fill (including polyfill) :

2.19.3 Fiber fill is crimped polyester Staple Fibre (PSF) hollow in cross-section so that it has loft, bulk, air circulation and resilience thereby making it a soft, light and durable material for filling in comfort products. Cotton has been used as a filling material in India since ages. However, with rapid development in man-made fibre production technology, synthetic fibres have replaced natural fibers to a large extent in the production of fabrics and garments. Special synthetic fiber known popularly as fiber fill has been developed as an alternative to cotton for filling purposes. The major applications of fiberfill are as filling material in pillows, cushions and stuffed toys, fiberfill wadding in quilts and for industrial purposes.

2.19.4 Fibre Fill is produced from a combination of Purified Terypthalic Acid (PTA) and Monoethylene Glycol (MEG) in a ratio of 9 : 1.

2.19.5 Fibre Fill (Polyfill) is also manufactured by recycling of polyester waste such as pet bottles or any other 100% polyester waste. The process involved converts the raw materials into flakes, washing, melting and then extruded through spinnerets to produce polyfill.

2.19.6 Normally these fibres are produced in 6 Denier and 15 Denier (also 3/4 Deniers) siliconized or non-siliconized. The fibre fill could be solid tubular cross section or hollow.

2.19.7 The major application areas of fibre fill/polyfill are for **(filling/stuffing)** applications and non wovens. In the former category of filling the products covered could be pillows, quilts, mattresses toys, sleeping bags, cushions,

garment insulation, etc. In the **non-woven** category the products manufactured are automotive interior carpets, filter media, shoe lining, etc.

2.19.8 Fibre fill both in the virgin and recycled form is manufactured by Reliance Industries Limited, Arora Fibre Limited, Ganesh Polytex Limited, Futura Polyesters Limited (IOC Limited), Harish Fibre Limited, etc.

2.19.9 The market and potential for fibre fill/polyfill is as shown below :

Table – 2.23

Market Potential of fibrefill (including polyfill)

Year	Market Potential	
	Quantity (Tonnes)	Value (Rs. Cr.)
2001-02	48,000	288.00
2003-04	60,000	360.00
2007-08	95,000	570.00

2.19.10 Unlike in developed countries the collection system of pet bottles is not organised in India restricting the availability of pet bottles as the source of the raw materials for polyfill. However, there is a steady improvement owing to environmental control measures and the supply situation of the pet bottles is expected to contribute significantly as a source of raw material for polyfill. Thus, there is scope for expansion of existing units (and also new units).

Jute Carpet Backing Cloth (CBC):

2.19.11 The Jute carpet backing for tufted carpets is either used in the form of a primary backing or as a secondary backing. Since jute was considered to be heavy and the jute weave was often damaged by the needles, it lost the primary backing market almost completely to alternatives like cloth woven or blown from polypropylene and other synthetics. However, in the secondary backing market, jute could retain its market share for a longer period, by reducing the weight of cloth per square metre through the years.

2.19.12 Jute faces competition as carpet backing material from foam and cloth woven from polypropylene. Synthetics have penetrated significantly as replacement material, both for primary & secondary carpet backing, still due to certain inherent advantages and jute being a natural fibre, it is expected that with the anticipated increase in the carpet production, the market for CBC will steadily grow.

2.19.13 Some of the leading producers of CBC are Auckland Jute Mills, Kolkata, Champadany Industries Ltd., Kolkata, Mohan Jute Mills Ltd., Kolkata, Birla Corporation Ltd., Gloster Jute Mills Ltd., Kolkata. The markets size of the products was 2900 MT valued at Rs. 9.86 crore during 2001-02. Import and export during the year 2000-01 was 532 MT and 811.67 MT respectively.

2.19.14 Considering the aanual growth rate of 19 percent, the potential market for the products in the year 2007-08 is estimated to be 13,900 MT valued at Rs. 41.70 crore.

2.19.15 The current global market for CBC has been around 35000 – 40000 MT per annum valued at around Rs. 100 – 130 crore. The Indian share in the total market in the year 2000-01, in quantity terms has been low at 20 percent. The tufted carpets producing countries of Australia, Belgium & UK account for almost 60 percent of the global consumption of CBC.

Stuffed Toys:

2.19.16 Stuffed toys are mostly made entirely of textile materials. The outer fabric or skins of stuffed toys are made of a variety of knitted fabrics in different colors and prints to make the toy appear real and beautiful. Almost 95 percent of the fabrics used in making stuffed toys are knitted because they give stretch and soft-feel to the toy.

2.19.17 Fur, fleece, velvet, lycra polyester felt, acrylic plush fabrics are amongst the commonly used fabric for making outers of a stuffed toy. Velvet and polyester felt are used mostly for making eyes, tongue, lips of a toy. Stuffed toys meant for export to colder countries such as Switzerland and Finland are made of 100 percent pure wool pile fabric and are stuffed with pure wool so that children feel warm. Pure wool pile fabric needed for making such toys is imported from Germany. The soft toy's skin is stuffed with different materials such as hollow polyester staple fibre popularly known as fiber fill, foam cloth scrap, paper foam, cotton. The commonly used fibre fill is 6D and it may be silliconized or non-siliconized. The siliconozed variant is softer and has better bounce.

2.19.18 The International standards such as ASTM (American Standard for Toy Safety) and the CE mark for toy safety standards given by European Community requires that the fabrics used should be azo free. In order to export toys to Europe, it is mandatory to obtain CE mark. For exports of toys to USA, the producers need to obtain ASTM mark.

2.19.19 The domestic stuffed toys market is seasonal. In comparison to the developed countries, the Indian soft toys market can be said to be still at its infancy. The more aware people in the upper middle and the upper class buy good branded quality soft toys from organized producers. Otherwise a majority of the population buys the unbranded low-priced toys from smaller stores and street sellers. Since Chinese and other imported toys are available in more varieties and at lower rates, the demand for imported toys is likely to be higher than the domestically produced toys.

2.19.20 Stuffed toys production requires good quality of fur fabrics and skill so that the minute detail in construction are done with superior finish to make the toy ultimately look beautiful and appealing. The most fundamental problem faced by the producers is the availability of fur fabrics.

2.19.21 About 70 large units making soft toys are located in Delhi, Mumbai &Kolkata. Some of these are EOU's. Further there about 500 small units mainly located in Delhi, Noida, Mumbai & Kolkata. The production of industry in the year 2001-02 was valued at Rs. 60 crore. Import during the year 2001-02 was 3.33 lakh nos. valued at Rs. 2.39 crore. Export during the year 2001-02 was 4.51 lakh nos. valued at Rs. 5.54 crore. The market size for the product is expected to increase to Rs.96 crore in the year 2007-08.

Blinds :

2.19.22 In India blinds are most commonly used in offices and commercial establishments. Their usage in household sector has been found to be very low. Vertical blinds have become an accepted covering for windows and chambers in the corporate sector. While vertical blinds provide outside view and are effective means for letting the desired amount of light to enter, they are not good options if privacy is desired. In case of vertical blinds with longer fabric louvers, the strips tend to move apart if a fan or an air conditioner is put on. As a result, roller blinds are being preferred in corporate sector for certain sections where privacy is a top priority.

2.19.23 Blinds are made of a variety of materials such as aluminium slats, cane or bamboo sticks also called chick, fabric louvers, poly vinyl louvers or specialized fabric sheets. The material chosen depends on the construction, which is a function of aesthetic and utilitarian characteristics. The extent of light & glare control and outside view desired, ease in handling and maintenance, acoustic performance, are amongst the most commonly sought after functional

characteristics. The commonly used blinds in India are vertical blinds, Venetian blinds, roller blinds and roman blinds. Venetian Blinds consist of 25 mm aluminium slats arranged horizontally. Recently, the indigenous variety of blind popularly known as chick is in demand. Modified varieties of chicks which have more textile and lesser bamboo, also called 'bamcot' are also in fashion these days. Vertical blinds consist of fabric louvers which can be tilted and stacked with the help of several components housed in the head rail of the verticals.

2.19.24 The fabric louvers are mostly woven on handlooms or power looms in polyester, viscose, cotton, acrylic, and blended yarns. The woven fabrics are provided with chemical coating so that the louvers become stiff and stand firm. Other varieties include glass fiber fabrics, black-outs, washable series and Jacquards. These louvers are available in four sizes in terms of width – 50 mm, 89 mm, 100 mm and 125 mm out of which 100mm width louvers are the top selling varieties constituting nearly 99 percent of the total vertical blinds requirement. Components such as hangers, runner, spacers, interlocking chain, head rails, sliding channel, end cap set, bottom weight, tilting chain, are either procured from domestic producers or imported from Taiwan, China and some of the European countries. Synthetic coated fabrics strips are also imported from Taiwan and China. Approximately 10 percent of the total fabric requirement for making louvers for vertical blinds is met through imports. The blind manufacturers have mostly entered into contract manufacturing with handloom owners for the production of such coated fabrics. Some of the popular names of the fabrics used for making fabric louvers for vertical blinds are Jacquard, Blackout, Signature, Equity, Trident, Harvard, Nature, Solar etc.

2.19.25 Hunter Douglas, Mac Décor and Viesta are the major players. There are a large number of small units also. Several handloom units located in Muzaffarnagar, Moradabad, Nasik & Hyderabad also supply the required fabric to Blind manufacturers. The producers of components viz., fabric and accessories are mostly small – scale units. Fabric production is done on handlooms on contract manufacturing basis. This enables a good degree of flexibility in the production system and to adopt to the changing market requirements. The production of bamboo stick chicks is clustered in the north eastern part of the country. Bamcot, which has more fabric component and lesser quantity of bamboo sticks is a recent development and is mostly made in Panipat and the region surrounding Delhi. These are woven in a variety of design on ordinary handlooms. The large companies have entered in the contract manufacturing with

domestic hand loom owners for their fabric louvers requirement. They also import specialized fabrics and accessories to cater to the domestic market.

2.19.26 Considering the domestic production of Rs. 360 crore and import of Rs. 40 crore in the year 2000-01, current annual domestic market was estimated to be valued at Rs. 400 crore. No export of these products is made from India. Considering a growth rate of 20 percent, the potential market for the product in the year 2007-08 is estimated to be Rs. 1190 crore.

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CHAPTER - 3

RAW MATERIALS FOR TECHNICAL TEXTILES

The raw material used for technical textiles are fibres available in various forms. These forms can be enumerated as below:

- Unspun staple fibres
- Spun staple fibres
- Multifilament yarns
- Monofilament yarns
- Slit films
- Extruded polymer form

3.2 The global consumption of fibres in various forms for manufacture of technical textiles is given Table – 3.1.

Table 3.1

Consumption of Fibres in various forms for manufacture of technical textiles

(million tonnes)

Sr. No.	Fibre Forms	2000		2005		2010	
		Volume	% share	Volume	% share	Volume	% share
1	Unspun staple fibres	6.4	38	7.8	40	9.8	42
2	Spun staple fibres	3.4	20	3.6	18	4.0	17
3	Multifilaments	3.1	19	3.5	18	4.1	17
4	Monofilaments	0.4	2	0.5	3	0.6	3
5	Slit films	2.0	12	2.4	12	2.9	12
6	Extruded polymers	1.4	9	1.8	9	2.2	9

Source: David Rigby Associates

3.3 Polymer is forecast to be the strongest growing variety with an average growth rate of 4.5 percent per annum upto 2010.

Classification of Fibres

3.4 The fibres can be classified as natural, synthetic, regenerated or inorganic. The David Rigby Associates Report shows that 16.7 million tonnes of fibre was consumed during the year 2000 for the manufacture of technical textiles (woven as well as non-woven). The fibre-wise consumption is shown in Table 3.2.

Table 3.2

Consumption of fibres for manufacture of technical textiles

(in million tones)

Sr. No.	Fibre Class	2000		2005		2010	
		Volume	% share	Volume	% share	Volume	% share
1	Synthetic	9.6	57	11.5	59	13.9	58
2	Natural	3.5	21	3.8	19	4.5	19
3	Inorganic	2.6	16	3.2	16	4.0	17
4	Regenerated	1.0	6	1.2	6	1.4	6
	Total	**16.7**	**100**	**19.7**	**100**	**23.8**	**100**

Source: David Rigby Associates

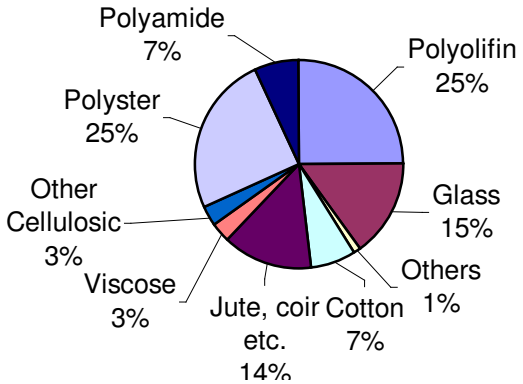
3.5 Inorganic fibres are forecast to show the fastest growth in volume terms at an average rate of 4.5 percent per annum upto 2010.

3.6 It is observed that synthetic fibres are predominantly used for the production of technical textiles. The advantage of synthetic fibres is that they can be customized to suit the requirement of technical textiles. There is a wide availability of polymers in the synthetic fibres. Polyester, polyamide, polyolefin, acrylic are a few common synthetic fibres. Aramid, carbon, ultra high modulus polyethylene (UHMPE), polytetra fluruoethylene (PTFE), Polyvinyl sulphide (PPS), and elastanes are a few high performance synthetic fibres. Among the inorganic fibres glass fibre has a wide usage as compared to asbestos.

3.7 Despite the considerable importance given to high value specialty fibres like aramid and carbon, standard textile polymers like polyester, polypropylene, along with glass and other natural fibres account for 99 percent of technical textile applications. The chart–3.1 illustrates the individual consumption of fibres for technical textiles.

Chart – 3.1

Consumption of Fibres for Technical Textiles



3.8 In addition to single polymer yarns and fibres, there are also many uses for combinations of different polymers specially engineered for specific end-uses. These are mainly in the form of Bicomponent fibres or graft copolymers. Few of the examples of Bicomponent fibres are listed below:

- **Al- and Es- ranges** – Polyethylene/ Polypropylene fibres produced by ES FibreVisions, Denmark for use in medical and hygiene textiles.
- **Ethylene vinyl alcohol (EVOH)** – Copolymer with EVOH sheath and polyester or polypropylene in core produced by Kuraray Co.Ltd., Japan suitable for specialty papers and nonwovens.
- **Visil 33 AP** – Silica /Cellulosic fibres produced by Sateri Oy, Finland is an inherently flame retardant fibre suitable for upholstery and insulation barriers.

3.9 A few of the numerous applications of major fibres are enumerated below.

***Natural Fibres*:**

3.9.1 Natural fibres still play a prominent part in many technical applications where man-made fibres are not suitable either for typical functional requirements or from cost point of view. For example, cotton is used for better absorbency in surgical and hygiene applications, jute for for biodegradable textile application, or, for packaging, geotextiles, composites from cost and environmental point of view, and sisal for ropes and twines, etc.

***Regenerated fibres*[*]:**

3.9.2 These fibres are said to be less popular for technical textiles applications. In this class, viscose accounts for nearly half of the consumption. The balance comprises of acetate and lyocell. Major applications include acetate for cigarette filters, spun laced nonwoven viscose for wipes and in incontinence products. These are said to have a growing market.

3.9.3 Among regenerated fibres viscose is manufactured in India in staple and filament forms. The common deniers available for viscose staple fibre are 1.2 and 1.5, costing about Rs. 80 per kg. In case of viscose filament the deniers available are from fine 75D to a coarser 600 D. While the cost ranges from Rs. 140 to Rs. 300 per kg.

[*] Fibres include both filament yarn and staple fibre.

Other regenerated fibres like cuprammonium rayon, Lyocell are generally imported depending upon the requirement.

Major Manufacturers*:*

3.9.4 Tencel Ltd., UK and USA (Tencel); Lenzing, Austria (Lenzing Lyocell); Grasim Industries; India; Kesoram Rayon Ltd., India; Century Rayon, India.

Synthetic fibres[*]*:*

Polyester*:*

3.9.5 Polyester offers an excellent price-performance balance, combined with a range of properties suitable for many industrial applications. They compete with viscose and polyamide in high tenacity applications like industrial yarns and tyres, and also compete with other fibres in protective textiles. There are continuous developments and applications in areas like geotextiles, fibrefills, recycling of polyester bottles, etc. However, the rate of growth of polyester application in technical textiles is likely to be affected by developments in various other synthetic fibres.

3.9.6 Polyester fibre is available in staple and filament forms. The filaments could be partially oriented yarns (POY), flat yarns (PFY) or textured yarns. Various specialty varieties of polyester filament such as microdenier, cationcally dyeable, high tenacity, fire – retardant, are produced in India. However, polyester staple fibre in micro denier, fire retardent and high tenacity are not produced in the country. Even dope dyed fibre is produced in limited quantities in few shades. Likewise, nano fibres, low melt fibres, split fibres, bicomponent, and conductive biodegradable polyester fibres are not produced in the country.

3.9.7 In India, polyester staple fibres are manufactured in denier ranges of 1.2 to 15.0, costing about Rs. 60 - 70 per kg. The filament is produced in normal and medium tenacity grades in the denier range of 80 to 600, costing Rs. 70 to Rs. 150 depending upon the variety. Recently coarser denier, high tenacity filaments yarns are being manufactured in India for industrial uses.

Major Manufacturers:

3.9.8 ICI Ltd (Terylene), Dupont, USA (Dacron), Hoechst (Trevira), Teijin (Tetron), Reliance Industries, India, Indorama Synthetics Ltd., India, Century Enka, India.

[*] Fibres include both filament yarn and staple fibre.

Polyamide:

3.9.9 Nylon – 6 and Nylon – 6.6 mainly constitute this class. They are used in applications where greater extensibility and high energy absorption capacity is required. The applications range from ropes, nets, conveyor belting, spinnaker sail to airbags. High price of this fibre has led to its substitution by various other fibres. Some newer varieties of polyester have substituted its use in tyre cords and coating substrates.

3.9.10 Nylon - 6 is manufactured in India in filament form in the denier range of 12 to 440 D, cost ranging from Rs. 130 to Rs. 200 per kg. Nylon filaments are also produced indigeneously in higher deniers of 840, 1200, 1600 for tyre cord applications. Nylon staple fibres are not produced in India. Nylon-6.6 filament yarn is also not produced in India.

Major Manufacturers:

3.9.11 Dupont USA (Nylon), Cortaulds, UK (Celon), Toray Japan (Perlon), Century Enka, India, Parasrampuria Synthetics, India, Modipon Ltd.., India.

Acrylic:

3.9.12 Acrylic fibres are largely used as a substitute for wool, while modacrylic and copolymers of acrylic are widely used in technical textiles as they possess fire retardant properties and resistance to weathering and UV rays. They are suitable for use as filtration media, protective clothing, furnishings, awnings and canopies. However, due to improved varieties of polyester, aramids and polypropylene, they are losing their market share. There may be a specialty market opened up for this fibre due to its intrinsic pore structure and its ability to incorporate various chemically and biologically active agents. One such example could be incorporation of phase change materials in acrylic fibres at the fibre spinning stage.

3.9.13 Acrylic staple fibres are manufactured in India in fibre, tow and top forms. The denier ranges from 0.9 to 7.5. The cost of the fibre ranges from Rs. 85 to Rs. 100.

Major Manufacturers :

3.9.14 Dupont,USA (Orlon), Monsanto, (Acrilan), Kuraray Co. , Japan (Vectran) , IPCL, India, Parsarampuria Synthetics, India.

Polyolefines:

3.9.15 Polypropylene production and use in technical textiles applications have grown rapidly than that of any fibre in any form including tape and film yarns. Polyethylene is also used, but to a lesser extent. In addition to major uses as ropes, cords, packaging, geotextiles and artificial sports surfaces, polypropylene yarns and non-wovens are being used for filtration, automotive carpets and furnishing, cover stock etc. In the Asian countries, the importance of polypropylene is expected to grow as a substitute for jute fibre.

3.9.16 Polypropylene fibre is manufactured in India in staple and filament forms. The fibres manufactured in denier ranges of 3 to 30, cost approximately Rs. 75 per kg.

Major Manufacturers :

3.9.17 Acordis Speciality fibres & yarns Ltd., UK, DS Fibres, Belgium, Marlow Ropes ltd., UK., Zenith Fibres, India, IPCL, India, Parasrampuria Synthetics, India.

High performance fibres

3.9.18 High performance and high value fibres provide advantage of combining properties suited to specific technical applications. They are not available in India and are not likely to be produced in the country in the near future. However, they are imported for specific end uses.

Aramid:

3.9.19 These fibres with dynamic energy absorption ability are suitable for protective clothing that offer ballistic protection, cut protection and high temperature protection. Meta – aramid having better thermal stability is more suitable for thermal protection and electrical insulation in composites and proximity suits. This fibre due to its high tenacity and especially high strength to weight ratio replaces steel in ballistic application. Also, it replaces polyester in filtration applications.

3.9.20 The approximate price of imported 1200 D aramid yarn is Rs. 6000 per kg.

Major Manufacturers :

3.9.21 Dupont, USA, (Nomex, Kevlar), Rhodia kermel, France (Kermel), Teijin Twaron, The Netherlands (Twaron)

Ultra high performance polyethylene (UHMPE)

3.9.22 This fibre possesses high modulus, high strength fibre along with exceptional strength to weight ratio, good UV resistance and low moisture absorption. It is most suitable for protection clothing against cut and ballistics and impact helmets. This is further improvement on aramid in improved impact resistance and weight reduction (lower fibre density), but it has poor temperature resistance as compared to aramid fibre.

3.9.23 The imported yarns in the denier range of 200 to 400 cost approximately Rs. 8000 to Rs. 15,000 per kg.

Major Manufacturers :

3.9.24 DSM Fibres, The Netherlands (Dyneema), Honewell high performance fibres, USA (Spectra)

Polytetrafluoroehtylene (PTFE)

3.9.25 This fibre with high chemical resistance, high density, low coefficient of friction, anti-stick property, thermal stability in the temperature range of – 240°C to + 260°C, resistance to UV radiation has relatively low tensile strength. It is suitable for filtration, aerospace apparel, marine sails, canvas and medical applications like artificial arteries, heart valves, etc.

3.9.26 The imported fibre costs approximately Rs. 3000 per kg.

Major Manufacturers :

3.9.27 Dupont, USA (Teflon), Lenzing, Austria (Lenzing Profilen), W.L. Gore & Associates, Germany (Rastex, Tenara)

Poly vinyl Alcohol (PVA)

3.9.28 This fibre is known for its high strength, abrasion resistance, elastic recovery and also excellent resistance to acids and alkalies. This makes it suitable for use in fishing nets, tarpaulins, sutures and also as chemical protective clothing and filter cloth. This fibre has ability to polarize light, hence can also be used in iridescent textiles. Another variety of PVA, having high solubility in water finds applications in textile processing.

Major manufacturers:

3.9.29 Nichibo Co.Ltd., Japan (Nichibo, Vinylon), Kurashiki Rayon Co.Ltd., Japan (Kuralon)

Novoloid

3.9.30 This fibre displays high flame resistance and ability to retain its form at high temperatures and possesses high resistance to acids, solvents, bleaches, fuels, etc. This makes it suitable for protective clothing applications.

Major Manufacturers :

3.9.31 American Kynol, USA (Kynol), Kynol Europa, Germany

Polyimide

3.9.32 This fibre has good chemical resistance and thermal resistance upto 260°C. It is most suitable for filtration of hot gases, cement etc.

Major Manufacturers :

3.9.33 Inspec fibre, Austria (P84), Meadowbrook Inventions, USA (Kapton)

Polyketones

3.9.34 This fibre has outstanding chemical, abrasion and high thermal resistance. Its serviceable temperature range is -60°C to +280°C. It finds applications in filtration, conveyor belts, dryer felts, etc. It can be blended with carbon fibre to form composites suitable for aerospace, automobiles and medicine.

Major Manufacturers :

3.9.35 Luxilon Industries, Belgium, Zyex, UK (Zyex)

Polyphenylene sulphide (PPS)

3.9.36 This fibre with mechanical properties similar to that of polyester has good chemical, heat and flame resistance. This fibre can be heat – set and heat moulded for specific applications. It is suitable for use in papermaker's machine.

Major Manufacturers :

3.9.37 Teijin Monofilament, USA & Germany, Toyobo Co. Ltd., Japan (Procon)

Polytrimethylene terephthalate(PTT)

3.9.38 This fibre is a variant of polyester. It has high elasticity and good elastic recovery, which deems it suitable for sportech.

Major Manufacturers :

3.9.39 Dupont, USA (Sorona), Solotex Corp, Japan (Solo yarn)

Poly butylene terephtahlate (PBT)

3.9.40 This fibre is a variant of polyester. It has high elasticity and good elastic recovery which deems it suitable for sportech.

Major Manufacturers :

3.9.41 Teijin Monofilament, Germany, Australian Monofilament Co., Australia

Poly vinyledene fluoride (PVDF)

3.9.42 This fiber with excellent chemical resistance and thermal stability is suitable for cable insulation and housing structure for electrical equipment in hostile environment.

Major Manufacturers :

3.9.43 Sider Arc, Italy, Polisilk SA, Spain (Solef)

Polybenzimidazole(PBI)

3.9.44 This imidazole fibre with high flame resistance and low shrinkage on exposure to flame, has high chemical resistance and high moisture regain too. It is suitable for fire protective clothing and space suits.

Major Manufacturers :

3.9.45 Celanese Acetate, USA

Melamine based fibre

3.9.46 This is a high temperature and fire resistant fibre with no melt dripping. It retains its serviceability upto 200°C. Being less expensive than m-aramid fibre, it is popularly used for fire protective clothing. However, because of its variable denier and staple length, low tensile strength, processing difficulty, it is normally

blended with other fibres for spinning satisfactory ring yarns. The imported fibre costs about Rs.1000 per kg.

Major Manufacturers :

3.9.47 Basofil Fibres LLC, USA (Basofil)

p- phynelene2,6-benzo bisoxazole (PBO) and Polyethylene2,6-naphthalate (PEN) fibre

3.9.48 These are high modulus, high dimensional stability with higher glass transition temperature, resistance to hydrolysis and high fire resistant. This makes them suitable for protective clothing applications.

Major Manufacturers :

3.9.49 Toyobo Co., Japan (Zylon)

Specialty Fibres

3.9.50 These fibres apart from moderate strength have specialty properties suitable for various end-use. These fibres have been recently developed to serve specific applications.

Polylactic acid (PLA)

3.9.51 This fibre is available in staple, filament and mono filament form and is derived from cornstarch or organic chemical intermediates. It has a tensile strength equivalent to polyester and nylon, has good resilience, excellent crimp and crimp retention with low flammability. It finds application in filtration, health care and agriculture textiles.

Major Manufacturers :

3.9.52 Cargill Dow Polymers, USA (Ingeo), Kanebo Gohsen, Japan (Latron), Unitika Fibres Ltd., Japan

Alginate

3.9.53 This fibre, synthesized from sodium alginate extracted from seaweed, is available in staple and filament form. It is suitable for use as moist wound dressing to aid faster healing of wound.

Major Manufacturers :

3.9.54 Acordis Speciality Fibres, UK

Chitosan

3.9.55 It is produced from de-acetylated chitosan of crab shells in filament form. The fibre has good strength, anti-bacterial and anti-static properties. It is suitable for use in healthcare sector and hygiene products. Nonwoven fabrics produced from this fibre are used as artificial skin that adheres to the body and stimulates new skin formation, thereby aiding faster healing of the wound.

Major Manufacturers :

3.9.56 Korea Chitosan Co., Korea

Chlorofibre

3.9.57 This fibre a copolymer of acrylonitrile and chloroethene has excellent flame retardant properties. It is suitable for upholstery and furnishings.

Major Manufacturers :

3.9.58 Rohvyl, France (Rhovyl)

R.Stat/P and R.Stat/N

3.9.59 The former is high tenacity polyester fibre coated with a fused skin (0.2µm)of copper sulphide, while later is nylon – 6,6 fibre with similar coating. These fibres produced by R.Stat, France serve as anti-bacterial as well as conductive fibres.

Spider's silk

3.9.60 Nexia Biotechnologies has found out a method of spinning spider's silk. This biopolymer fibre is found to have high tenacity (five times the strength of steel) and elasticity (twice the elasticity of polyamide) and is suitable for applications in medical sutures, biodegradable fishing nets, soft armour and unique material composites.

Major Manufacturer:

3.9.61 Nexia Biotechnology, USA

Inorganic fibres

Glass:

3.9.62 Glass fibre in different forms is a major technical textile fibre, which accounts for almost 15 percent of worldwide technical fibre consumption. Shorter

glass fibres are used for glass reinforced plastic (GRP) applications, and textile products made by conventional operations like weaving, knitting and braiding. Their main end uses are for advanced high performance composites reinforcements or for cement reinforcements, due to its high tenacity and high modulus properties. The fibre is available in various grades like E-glass, C-glass and S-glass. The imported E-glass filaments in denier range of 600 to 1200 cost about Rs. 150 per kg.

Major manufacturers:

3.9.63 ACI Fibreglass, Austria, Owen-Corning, USA, Nippon glass Fibre, Japan, Owen-Corning, India, Vetrotex, India.

Carbon:

3.9.64 This is another fibre suitable for applications in composites. Its composites are suitable for aerospace applications. Other areas where carbon fibre composites find use is light weight machinery components, high-pressure tanks, wind generator blades and leisure products like golf clubs, fishing rods, etc. These fibres are largely used for their high tenacity, high modulus and anti-static properties.

Major Manufacturers :

3.9.65 SGL Carbon Group, UK (Panox and Sigrafil C), Tenax Fibres, Germany, Fortafil Fibres, USA (Fortafil)

Basalt:

3.9.66 This fibre obtained from molten basalt rock has an extremely high range of thermal stability (- 260°C to + 850°C). It maintains its consistency in aggressive thermal and chemical conditions. Its is suitable for use in protective textiles like proximity suits (thermal, electrical and hydro-insulation) and reinforcement.

Major Manufacturers :

3.9.67 EBAS Roving, USA

Electroconductive fibres

3.9.68 To overcome the problem of static charge in synthetic fibres, conductive finishes are applied on their surface. These are non-durable in nature, hence

conductive fibre like steel, aluminum, copper, etc are blended with synthetic fibres. These are suitable for conductive textiles, textiles for electromagnetic shielding, etc.

3.9.69 Ceramics and silica form the other inorganic fibres that find applications in insulation, reinforcement of concrete, filters, ropes and protective clothing.

Major Manufacturers :

3.9.70 ICI Chemical & Polymers, UK (Saffil,Saseal, Ecoflex)

3.10 Properties of some of the high performance fibres are shown in **Appendix-3A**. The summary of applications of various fibres in the twelve different segments of technical textiles has been compiled in **Appendix-3B**.

Applications of various fibre forms in Technical Textiles

Unspun Fibres

3.11 A large volume of fibres is used in the unspun form for manufacture of technical textiles. These include fibres in the various forms like carded webs, fibrefills, composites and in the tow forms. Few of the areas using unspun fibres are Buildtech (reinforced components), Indutech (filtration products, wipes, electrical composites, papermaker's felt, cable components, battery separators), Mobiltech (interior trims, carpets, air cabin filter), Hometech (nonwovens carpet backing, fibrefill, GRPs in household goods) and Clothtech. Building reinforcements is the largest consumer of unspun fibres. These are estimated to have an average global growth rate of 4.5 percent per annum *(Source: David Rigby associates).*

Spun Yarns

3.12 Technical textiles consume about 3.4 million tonnes of spun yarns, mainly for woven applications. The various systems included in staple spinning are ring, flyer, open-end, friction spinning. Compact spinning is a relatively newer technology for spinning even yarns. Friction spinning helps to produce structured, composite yarns and also cheaper yarns suitable for carpet backing, filtration and cleaning materials.

3.13 However, spun yarns have a low growth in market for technical textiles. This could be attributed to the following factors:

- Growing consumption of non-woven fabrics in technical textiles (unspun fibres)

- Synthetic fibres in filament form are preferred in most of the technical textile applications.

3.14 Packaging textiles consume a large quantity of spun yarns especially for bulk packaging (sack and flexible intermediate bulk containers). Home textiles is another area that uses spun yarns for furniture components, platform cloth, dust cloth, mattress components, curtain tape and tickings. Some other applications of spun yarns could be in the field of Clothtech, Sporttech and Agrotech.

Multi-filament yarns

3.15 These yarns are used in technical textiles in woven as well as knitted forms to an extent of 3.1 million tonnes. Major proportion of multifilament yarns (64 percent) is of the high tenacity class. The rest mainly includes the microdenier yarns of normal polymers to be used for non-linting, dustproof clean room apparel and specialized cleaning and filtration products. Although they are projected to grow at 3 percent per annum, the overall consumption of multifilament yarns is expected to reduce due to the developments in newer fibre forms and fabric technologies.

3.16 Mobiltech is a major area of technical textiles that consumes multifilament yarn for applications like tyre cords, hoses, drive belts, etc. The other segment of technical texitles viz., Indutech is likely to have a growing demand for multifilament yarns for development of printed circuit boards. Few other major applications areas for these yarns are Sporttech, Agrotech and Protech.

Monofilament yarns

3.17 Global consumption of monofilament yarns was 0.4 million tonnes in the year 2000 and is estimated to grow at the rate of 4.4 percent per annum till 2010. Monofilaments of certain specialized polymers as well as normal polymers are used for applications like ropes, twines, sewing threads, brushes, screens and meshes for printing and filtration, zip fastners, hook and loop fastners, belting, fishing nets and papermaking dryer fabrics. Fishing uses monofilaments to an extent of 46 percent of the total monofilament consumed. Apart from Agrotech, other user segments for monofilament yarns are Buildtech and Clothtech. The monofilaments could be of polyester, polyolefin or polyamide.

Tape and slit films yarns

3.18 Tape and slit films are mostly extruded polyolefins for use in packaging, carpet backing, geotextiles, ropes, cords, nets and artificial sports surfaces. They had a market of 2 million tonnes in 2000 with a projected average annual growth of 4.1 percent. It is reported that the major application area for these yarns is Packtech; other important areas being Sporttech, Agrotech, Geotech and Hometech.

Extruded Polymers

3.19 Spunbonded, meltblown and similar extruded nonwovens are used for technical textiles applications to an extent of 1.4 million tonnes in 2000. These products are projected to have an average annual growth rate of 4.5 percent till 2010. Major applications of these polymers are in the areas of Goetech, Agrotech, Buildtech (building components), Indutech (filtration products), Packtech and Medtech (coverstock, healthcare textiles). Medtech and Buildtech form the major segments using polymer form of fibre.

3.20 The global consumption of various fibre forms viz., fibres, filaments, tapes / slit films, etc in segments of technical textiles in the year 2000 and as projected in year 2010 is shown in Table-3.3 and Table-3.4, respectively.

3.21 India is a traditional producer of many natural fibres like jute, cotton, hemp, etc which can be utilised in certain biodegradable technical textile products. Nylon, polyester, polyethylene, glass, etc also has taken a firm footing in India and high tenacity industrial fibres are also being produced in the country. High performance fibres are yet to be produced in the country and it is unlikely that technology and know-how of production of these fibres will be transferred to India in near future. Nevertheless, they are commercially available in India for carrying out specific product developments and re-export after value-addition.

Table 3.3

Application-wise global consumption of fibre/filament/split film (2000)

(Volume in '000 tonnes)

Application area	Polymer	Fibre	Spun Staple	Multi-filament	Mono-filament	Tape/ split film	Total
Agrotech	43	21	234	295	232	556	1,381
Buildtech	183	1,217	37	152	52	7	1,648
Clothtech	60	718	300	135	25	0	1,238
Geotech	18	109	7	73	12	36	255
Hometech	221	978	530	72	24	360	2,186
Indutech	58	1,625	163	321	34	4	2,205
Medtech	685	732	122	4	0	0	1,543
Mobiltech	56	929	96	1,346	3	50	2,479
Packtech	37	14	1,584	19	18	880	2,552
Protech	50	2	50	135	0	0	238
Sporttech	26	72	278	530	7	76	989
Total	**1,438**	**6,417**	**3,401**	**3,083**	**406**	**1,969**	**16,714**

Source: David Rigby Associates

Table – 3.4

Application-wise global consumption of fibre/filament/split film (2010)

(Volume in '000 tonnes)

Application area	Polymer	Fibre	Spun Staple	Multi-filament	Mono-filament	Tape/ split film	Total
Agrotech	80	40	291	435	360	751	1,958
Buildtech	272	1,923	52	250	85	10	2,591
Clothtech	81	994	372	171	38	0	1,656
Geotech	38	163	12	122	19	58	413
Hometech	351	1,443	607	99	32	321	2,853
Indutech	118	2,333	214	537	50	5	3,257
Medtech	1,026	1,212	136	4	0	0	2,380
Mobiltech	75	1,512	106	1,568	2	74	3,338
Packtech	56	69	1,832	38	27	1,584	3,606
Protech	86	3	68	183	0	0	340
Sporttech	43	108	348	741	12	130	1,382
Total	**2,227**	**9,799**	**4,039**	**4,147**	**628**	**2,933**	**23,774**

Source: David Rigby Associates

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CHAPTER - 4

NON-WOVEN SECTOR OF TECHNICAL TEXTILES

Introduction

Nonwovens are probably the only products to have a negative definition. It does not give a positive definition of what it is but instead states that it is not woven. With such a description it is not surprising that most people are not aware of Nonwovens despite the fact that most of them may be directly or indirectly using or coming across it several times each day.

4.2 Nonwovens have even been described by some as invisible fabrics as we use them without realizing it. Nonwovens have been a part of our daily life and yet we may not even be aware of them. Tea bags, filter in the coffee maker, wipe, mop, inter-lining of shirt collar and cuffs, shoe components, automobile carpet, door panels, roof liner, filter for air conditioner, insulation felts for cars, wall coverings, vertical blinds, bag filters for dust collection system, liner of the floppy, pad of the photo copier, gowns, masks, band-aid, diaper and blankets etc. are some of the non-woven items which are used by us in daily life without realising that those items are either made up of non-woven or contain part of non-wovens

4.3 These are only a few examples, which are common and more visible. Nonwoven manufacturing processes are such that one can develop fabrics for specific end uses and the possibilities are limitless.

4.4 The Nonwoven Industry is relatively new and first came into existence in the 1950's. However it experienced significant growth, acceptance and broad application only in the late sixties and early seventies in America and Europe. During the last three decades, the growth rate of Nonwoven Industry has been higher than most other manufacturing industries in America and Europe. Even today the growth rate is above average industry level and is more so as compared to the conventional textile Industry whose production has been reducing or stagnating in most parts of the world. In Asia the major producers are Japan, Taiwan and Korea and China. The growth of the Nonwoven Industry in Mainland China has been quite spectacular during the last 15 years. While the Nonwoven Industry in India is still in its early infancy, it has a bright future.

Origin of industry

4.5 The Nonwoven industry has its origins in three distinctly different technologies and related businesses, which are as follows.

One - Traditional Textile Industry
(The Dry Form process, which includes the standard carding system of fibre processing)

Two - The Paper Industry
(The wet process here short fibres are used and processes followed are similar to paper making)

Three - The Synthetic Fibre Industry
(Basically includes the Spun-bond and Melt-blown Nonwovens)

4.6 Each of these originating industries developed a distinctive type of Nonwoven process. Even though each of these three basic processes is distinctly different, they gave rise to products that were quite similar and somewhat interchangeable. As a result, the Nonwovens industry has emerged at the interface of the three originating industries and technologies with some overlapping and merging of products, processes and businesses. However, the process adopted enables the product manufactured by a particular process to meet more exact requirements or certain cost advantages and therefore it is unlikely that ultimately seemingly similar products manufactured by the different Nonwoven processes could really compete with each other.

4.7 The early years of the Nonwoven Industry were characterized by an emphasis on product substitution to replace traditional woven and knitted fabrics. As a result, these products were not 'over built' like many of the woven products. Thus, nonwovens of a lower weight and higher speed of production and hence of lower cost found it relatively easy to replace the heavier woven fabrics produced at much slower speeds. Products substitution was the focal point during this stage. Also, in the past, the growth of the Nonwoven Industry was technology-driven, as new systems were introduced, providing the market place with alternative products.

4.8 More recently, it has become very difficult to find remaining applications that are suitable for replacement by Nonwoven Products. Hence, the current effort is directed towards developing totally new markets that can exploit the properties

of nonwoven fabrics. We therefore, like to refer to such fabrics as engineered fabrics. This has made the market development effort more difficult but has put the new applications on a firmer basis as these niche markets are better served by the Nonwoven engineered for that specific purpose. The industry is now therefore market-driven and is therefore constantly growing by developing new products and applications.

Basic nonwoven technologies

4.9 The three key process elements of any nonwoven technology are as follows.

a) **The Web-forming Process**, i.e. the formation of the fibres or filaments into a continuous web of specified weight and width.

b) **The Bonding Process**, i.e. the bonding of the fibres or filaments of the web so as to form the fabric.

c) **The Finishing Process**, i.e. the additional processing such as chemical coating, calendaring, printing, etc.

4.10 Nonwoven Fabrics are differentiated as per the technology/process used for web formation and/or the bonding technique used to form the fabric.

4.11 **The Dry Form Process**: The Dry Form Nonwoven Technology arose from the traditional textile industry. In the first stage of the yarn making process, cotton, wool or man-made staple fibres are opened and carded (combed into a parallel sheet of fibres) to produce a carded web. To produce yarn, the web is bundled together into a roving and then drafted and twisted into a yarn. To produce a Nonwoven, the carded web is not bundled together but consolidated into a continuous sheet of fibres. In the Spun-bond / Melt-blown Process, instead of starting with fibres, polyester/polypropylene granules are extruded into filaments by process similar to fibre manufacture. The individual filaments are further laid into a continuous sheet.

4.12 The original cards adopted from the traditional textile industry align all the fibres in the machine direction (MD). Such webs have good strength in the machine direction but poor strength in the cross-direction. However, newer carding machines known as random cards manufactured specifically for Nonwovens, can realign the fibres randomly and as a result the strength is some what equal in all directions.

4.13 We now proceed to the different web consolidation techniques. The system adopted depends on the type of products to be manufactured and the subsequent bonding technique being adopted.

4.14 The Dry Form Process starts with staple fibres that are opened and carded into a light sheet of fibres or start with synthetic polymer granules such as polyester or polypropylene and extrude same into a light sheet of filaments. This light sheet is then consolidated into a thicker continuous sheet of fibres/filaments of desired weight/sqm and width.

4.15 Webs are consolidated by the following three basic methods: Parallel Laid, Cross-Laid and Random / Air Laid.

4.16 The simplest form of web consolidation is the Parallel Laid system. The Parallel Laid system is generally used for light weight nonwoven i.e. finished fabric weights between 12 gsm to 75 gsm. This system has several cards arranged one behind the other. The webs from the cards drop down onto a conveyor belt, i.e. the webs from the card in front gets dropped onto the web or webs coming along the belt from the card or cards behind it. When the consolidated sheet of webs reaches the front end, it is then taken up for bonding. It is possible to change the web coming from each card. Therefore, e.g. if we want a final consolidated weight of 15 gsm, it is possible to get this from one single card, however the distribution of fibre will not be uniform, we will therefore use at least 3 or 4 cards, each delivering a web of 4 to 5 gsm so that by the law of averages, the fibre distribution in the consolidated layer of webs shall be relatively more uniform. In this process the maximum weight possible is the total of the maximum weight of web possible from one card multiplied by the number of cards installed. Generally not more than 5 cards are installed and also the cards are of the type which deliver very light webs of 3 to 10 gsm. Such cards generally use finer denier fibres. In this process the width of the fabric is limited by the width of the card.

4.17 The second form of web consolidation is the Cross Laid system. In this process we are able to alter the width and the weight of the consolidated layer. The web from the card is dropped onto a moving conveyor known as floor apron. This apron is moving in forward direction at right angle to the machine direction of the card. The web falling on the apron forms folds in a scissor-like action. However, since the speed of the web being dropped and the forward motion of the apron are both fixed, the angular folds over-lap uniformly and the consolidated web have equal fibre distribution throughout the length and breadth of the consolidated web. In this system the fibres in the consolidated web are primarily

oriented in the X-direction. Therefore, fabrics produced from X-laid webs, have more strength in X-direction i.e. widthwise as compared to lengthwise. The advantage of this system is that we can change the weight and width of webs as per our choice and also make very heavy fabrics which is not practically possible in the parallel laid system.

4.18 The third method is to form a Random Web usually by an Air-laid system onto a condenser. This method is more suited to heavier fabrics.

4.19 Once the consolidated web is ready, the bonding process starts. The nonwoven fabric is produced by the bonding of the loose fibres in the consolidated web. There are three basic methods of bonding

1. **Chemical or Resin bonding**
2. **Thermal bonding**
3. **Mechanical bonding**

Chemical Bonding:

4.19.1 Here we use binder adhesives of latex /SBR, PVA, or synthetic acrylic resins. The fibre used will generally be restricted to those which lend themselves to bonding e.g. polypropylene would generally not be suitable for chemical bonding. The most common fibres used for fabrics made by chemical bonding are cotton, viscose and polyester.

4.19.2 The bonding can be by dip saturation, by padding or by use of transfer rolls or spray. Saturation and padding are generally used for slightly heavier weight fabrics. Here the entire consolidated web is passed through a bath and the excess binder squeezed out and dried. The drying can be by drying cylinders or stenter type ovens.

4.19.3 The transfer roll method is used for light weight fabrics such as interlinings and disposables. Here binder from a bath is picked up by an engraved roll and the binder from this roll is transferred to the light web, which is then dried, generally on drying cylinders. Parallel Laid webs are generally used for making light weight resin bonded nonwovens.

4.19.4 The spray method is generally used to produce what are known as waddings or Hi-loft nonwovens, which are fairly porous type of fabric sponge. Here the binder is sprayed only on the surface. By application of a mild suction some of the binder penetrates into the thickness of the fabric also. First one side is sprayed and

dried, then it is reversed and the other side also sprayed and dried. Such fabrics are generally used for lining of winter jackets, quilts etc.

4.19.5 Air-laid Random webs or Cross Laid webs are generally used for resin-bonded Hi-loft / wadding type nonwovens

Thermal Bonding:

4.19.6 In this process we use heat to bond the fibres in the consolidated web. This process is generally used for light weight nonwovens. The light consolidated web from a parallel-laid system (the fibres used are a blend of regular fibres with low-melt fibres or bi-component fibres with sheath/outer core of low-melt polymer) is passed through a heated calendar whose one top roll is engraved with points. The raised points apply heat and pressure to the fibres at the contact points and due to this the fibres melt at these points and fuse with the other fibres to cross-link and form a fabric. This process is most popular for the manufacture of cover-stock for sanitary napkins and baby diapers. Polypropylene fibre is used in such fabrics. Polypropylene has the property to transfer moisture by capillary action to the inner core of the napkin. Also the fabric itself does not absorb any moisture and remains dry. Until recently in India all napkins used chemically bonded nonwovens. This has two disadvantages, one – the coverstocks remains wet and therefore gives discomfort and two-the use of chemical binders may cause skin irritation to some. Thermal Bonded Nonwoven fabrics are also used extensively for disposables such as wipes, hospital gowns and caps etc.

4.19.7 The Thermal Bonding method can also be used for hi-loft or waddings. In this case, some bi-component fibres are blended with the regular fibre. The consolidated web is passed through a hot air oven where the bi-component fibres fuse and bond the other fibres. On account of environmental reasons and also for energy savings, the Thermal Bonding technique is replacing chemical bonding for many products. Thermal Bonded Felts are used in air-filtration systems as they offer good filtration properties will low pressure drop and high dust loading capacity.

Mechanical Bonding:

4.19.8 In this process, the individual fibres in the consolidated web are interlocked with hundreds of other fibres in the web to produce a felt-like fabric.

4.19.9 The most common mechanical method is the Needle Punching technique. In this method generally a cross-laid consolidated web is used. Fibres could be

practically any staple fibre, natural or synthetic. Even steel fibres and glass fibres can be needled. The fibres in the consolidated web are entangled with each other by processing it through what are called Needle Looms. In the loom there are boards fitted with several thousand needles along their full length and. There are barbs on the sides of the needles. The needle board moves up and down very rapidly and the needles penetrate the web and come out each time. During this process, the individual fibres are caught in the barbs of the needle and get inter-locked with other fibres to form a felt like fabric.

4.19.10 To achieve the desired bonding and compactness, it is common practise to have several needle-looms in a row. By repeated needling, the fibres are increasingly interlocked and the fabric compacted. However, care must be taken not to overdo the needling as it is likely to damage the individual fibres. The amount of needling depends on the product being manufactured.

4.19.11 We also have what are known as structuring looms, these looms are basically used for making designed carpets. Here a nonwoven fabric produced by the normal needling process is passed through a loom which has needles arranged in such a way as to give a designed effect on the surface.

4.19.12 A relatively new process known as Hydro-entanglement or Spun-lace has been developed, where instead of needles there are thousands of high pressure jets of water that shoot through the web of fibres. As a result, the fibres in the web get entangled. This produces a beautiful soft nonwoven. The only disadvantage is that the process is suitable only from relatively lower weight fabrics i.e. between 50 to at most 200 gsm.

4.19.13 Another mechanical method is what is known as stitch bonding. This process is quite similar to quilting, only difference being that in stitch bonding the needle-spacing is very close and along the full width of the machine. The web is fed into the machine and filament yarn used to put stitches to convert the web into a fabric held together by the close stitches. It is possible to form the fabric even without use of the yarn wherein some fibres from the web itself are used to make the stitches.

4.19.14 All the above are basically techniques for bonding of webs made by the dry form process.

4.19.15 The Wet Process is essentially same as paper making process, but is classified under Nonwovens only because very short staple fibres are used instead of pulp. Very short length cellulosic staple fibres are generally blended with some

cellulose pulp and made into a paper like fabric using basically the paper technology. Fabrics made by this process are mostly used as tissues. They have soft feel, good absorbency and better wet strength as compared to normal paper tissues.

4.19.16 The Spun-bond Process, by extrusion processes similar to those employed in making of synthetic fibres by melt-spinning, plastic raw material from the pellet form is converted into fine continuous filaments. The major difference being that instead of drawing the filaments, crimping and subsequently cutting of the tow into staple fibres, here we consolidate the extruded filaments onto a conveyor in the form of a continuous sheet with loosely heaped filaments. Then as in the case of earlier bonding processes, we bond the filaments in the layer to form the fabric. In Spun-bond process the most common method of bonding, is that of thermal bonding by calendar system. Some Needle-punching may also be done individually or before thermal bonding depending on the product application. The polymers generally used are polyester and polypropylene. Polypropylene is used most for making light weight cover-stock of sanitary-napkins and baby-diapers, as also hospital disposables such as gowns, masks etc. Polyester is used more as geo-textiles and as substrate for bitumen felts.

4.19.17 Another process using plastic raw material as input is the Melt-blown process. It is similar to plastic film extrusion process except that the extruded film is immediately subjected to high velocity air blast, which breaks up the hot resin film into micro fibres. The spray of micro-fibres is deposited onto a forming belt and thermally bonded to form the fabric. Due to the presence of micro-fibres such fabric form very good filter media and used for fine filtration applications. Composites of Spun-Melt-Spun (SMS) are also made by having a melt blown film sand-witched between two spunbond layers.

4.20 So far, we have covered the web forming processes and the bonding process.

4.21 The finishing process usually consists of physical, chemical or thermal processes and combinations thereof, such as calendaring, embossing, singeing, lamination, coating, impregnation, perforation, printing etc.

Application

4.22 The Nonwovens industry consists basically of what are known as rolled goods manufacturers and converters. Rolled good manufacturers are those who manufacture nonwoven fabric and supply it in roll form. Then there are the

nonwoven converters who process and convert the nonwovens for use by consumers or as inputs to other industries.

4.23 The Major areas of product application are as follows:

Disposables:

Personal, Household and Medical:

4.23.1 Disposables constitute a significant share of Nonwovens use. Here the most common application is cover-stock for sanitary napkins and baby diapers. To begin with chemically bonded nonwovens were used as cover-stock. However, in such fabrics, they remain a little wet and cause discomfort. Therefore, majority of napkin manufacturers have switched over to thermally bonded nonwovens made from polypropylene. Polypropylene by capillary action immediately transfers moisture to the inner core of the napkin. It also does not absorb moisture. Therefore, thermally bonded nonwoven have practically replaced chemical bonded nonwovens all over the world.

4.23.2 Another, large area where light weight nonwovens are used is protective clothing, i.e. gowns, masks, caps. Also nonwoven fabrics are being increasingly used as bed-linen, pillow covers etc. in hospitals. For such applications, carded thermal bonds/ spun-bonds / hydro-entangled nonwoven fabrics are used. The advantage of hydro-entangled nonwovens is that they have a very soft feel.

4.23.3 Another, large area is that of wipes. Here, mostly needle-punched/thermal bonded or hydro-entangled (spunlace) Nonwovens are used. Both dry and wet wipes are popular.

4.23.4 Nonwovens are also used is surgical dressings and wound-pads. One other important medical application is orthopedic cushion bandages. These bandages are used under plaster casts. Earlier cotton waddings were being used but now needle-punched nonwovens are used because they retain their cushioning effect in the moist atmosphere between the skin and plaster.

Home:

4.23.5 The most common is the needle-punched carpet. They are very popular on account of their low cost. Now with the improvement in the needling machines and with the different structuring capabilities, nonwoven carpets are becoming more and more popular. Similar but lighter weight patterned fabrics are used as

wall-coverings. Of course this is not suited for our type of climate and for that matter even carpets are not really suited for use in most parts of our country.

4.23.6 Another, new development is a thermally bonded nonwoven which is made by polypropylene and has an embossed design. The fabric is slit into strips and vertical blinds are made. It is very cost effective as compared to woven vertical blinds.

4.23.7 Nonwovens are extensively used in up-holstered furniture and mattress. They are used for padding or for quilting. They are not affected by water or dampness and do not form hard lumps later. On account of their good initial tear resistance and also resistance to tear propagation; spun-bonded nonwoven fabrics are increasingly used as furniture backing fabrics.

4.23.8 Hi-loft waddings are used for quilts on account of their low weight and long life. Also nonwoven waddings are used in pillows. The filling in these pillows have hollow fibres, which are siliconised. As a result, they are very light, highly springy and most important don't make a crackling sound when compressed. If ordinary polyester fibre is used then it tends to make a slight sound when you shift your head. Hi-loft waddings from such hollow fibres are also used for winter jackets etc.

Clothing

4.23.9 Another very big application is that of interlinings. The general impression is that interlinings provide stiffness. However the main function of an interlining is to give shape and to prevent wrinkles after washing. There are two types of interlinings. One which is known as basic, such as linings sewed along with the garment. Other is fusible with an adhesive coating on one side. Fusible linings are ironed onto the area of garment where stiffness is required. India being a large garment exporter, this is one area of nonwovens which is already fairly well developed. Most export garments require nonwovens interlining while the domestic market still uses mostly woven interlinings. Nonwoven waddings are used in winter clothing. These wadding are generally made of polyester.

Footwear

4.23.10 The shoe industry offers one of the largest markets. Except for the bottom sole, it is possible to make a shoe entirely of nonwovens. The insole in sports shoes is generally nonwoven, the inside linings are nonwoven. The stiffeners in the heel and toe are nonwoven. The upper is a nonwoven coated with PU. The manufacture of the high quality leather-like fabric by PU coating of a specially processed nonwoven is very interesting. First a very thick nonwoven is

made. It is made very compact by repeated needling. Then it is impregnated with acrylic and SBR binder. This fabric is then cut into very thin sheets along the thickness by a very special splicing device. The advantage is that very uniformly thick nonwoven is obtained and as a result the coating of PU on it can be kept to minimum. With the growth of shoe industry, the nonwoven requirement from this sector is expected to be very big.

Industrial

4.23.11 Nonwovens are used extensively in Industry, particularly for filtration. One of the largest application of needle-punched felts is for dust collection bag filter media. Another large area is liquid filtration. Hi-loft waddings are used for fresh air filter systems. Polyester Nonwovens are used as insulating cover for cable wrapping. Polyester felts are used to make bitumen composites for water-proofing in construction. Many coated fabrics for various applications are made with Nonwovens as substrates.

Civil engineering

4.23.12 Nonwoven Felts: Needle-Punched and Spunbond offer very good properties of filtration, separation, drainage and protection in civil construction. These are known as geo-textiles and are now extensively use in construction of roads, railway tracks, soil erosion control, slope stabilization, canal lining, drains, dams etc. The cost-benefit of this material is very great and the potential for this application in India is very large due to the infra-structure development works in progress.

Automotive:

4.23.13 Nonwovens are used very extensively in Automobiles. It is used for carpets, insulations, headliners, door panels, parcel shelf, padding in seats etc. Approximately 8-10 kg of Nonwovens of different kind are used in each car.

Agriculture:

4.23.14 Light weight spunbond Nonwovens are used extensively for crop protection.

4.24 Above are only a few examples, the existing uses are far too many to enumerate and the possibilities for new applications are without limit. It may only be a matter of time before regular garments for personal use may be made from Nonwovens.

4.25 The manufacturing processes of some nonwovens are given in **Appendix-4A**.

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CHAPTER - 5

PHASED PROGRAMME OF DEVELOPMENT- PREFERENTIAL SEGMENTAL COVERAGE

Technical Textiles represents a multi-disciplinary field. The range and diversity of raw materials, processes, products and applications that it encompasses is enormous. The technical textiles supply chain is a long and complex one, stretching from the manufacturers of polymers for technical fibres, coating and specialty membranes to the converter and fabricators who incorporate technical textiles into finished products or use them as an essential part of their industrial operations. Such user industries cover wide range of fields like Garment & Shoe industry, Food processing, Pharmaceuticals and Chemicals, Agriculture, Automobiles, Aviation, Defence, Civil Engineering, Medical & Personal Hygiene, Cement, Steel, Mining, Petroleum, Packaging etc. The economic scope and importance of technical textiles extends far beyond the textile industry itself and has an impact on almost every sphere of economic activity.

5.2 Depending on the product characteristics, functional requirements and end-use applications the highly diversified range of technical textile products have been broadly grouped into 12 sectors as detailed out in Chapter – 1 at Para 1.4.

5.3. Each of the 12 groups cover number of products. In all, there will be hundreds of products. The committee thought it prudent to identify some products based on the industries capability, infrastructure, know-how and market potential for initial prioritisation for development instead of thinly spreading resources on creating support infrastructure for a large number of diverse products. Accordingly from Phase-I report of the TECS survey of the textile industry, the committee shortlisted the 25 product groups for prioritisation based on the market potential for each of these products and identified 10 products / product groups for preparation of project profiles by the TECS in the Phase-II of the report for generating the interests of the industry for producing such items in the country.

5.4. 25 products were shortlisted on the basis of market potential. However, the market potential depends on certain factors. For example growth of geotextiles, FR textiles, scaffolding nets, etc., depends on regulatory prescriptions for the usage of such items. Products like incontinence diapers, disposable health care textiles, fibre fill, shade fabrics etc. need aggressive marketing and promotional efforts. Some products are import substitute products while some products are bound to grow due to rapid expansion of end user segment. The identified 25 products are listed below:

5.5. *Geo-textiles*

Product	Market size (Estimated)				Potential market size	
	2001-02		2003-04		2007-08	
	Quantity	Value (Rs.crore)	Quantity	Value (Rs.crore)	Quantity	Value (Rs.crore)
Geotextiles	-	100	-	300	-	2640
Geogrid	-	10	-	50	-	214

- With the government thrust on the development of infrastructure and major infrastructure development projects under implementation (or likely to be taken up in the near future), geo-textiles has high growth potential.
- The total investment by the government during the period 2001-02 upto 2007-08 in the infrastructure development is expected to be Rs.2,19,661 crore. Assuming the geotextile content to be at 3 percent, the market size for geotextiles during the period would be Rs.6591 crore. During the year 2007-08, it is expected to be Rs.2640 crore.
- The demand for geogrid in the year 2007-08 is expected to be Rs.214 crore.
- There is a need for inter-ministerial coordination for promoting the usage of geotextiles and government has already set up an Inter-Ministerial Committee under the Chairmanship of Secretary (Textiles).
- Currently, there is no legislation for mandatory use of geotextiles. **The committee has suggested mandatory usage of geosynthetics for construction of road (where subsoil CBC is less than 3) and asphalt pavement overlay, which would enhance the demand of geo textiles**.

5.6. *Webbing for seat belts*

Product	Market size (Estimated)				Potential market size	
	2001-02		2003-04		2007-08	
	Quantity (Mn.nos)	Value (Rs.crore)	Quantity (Mn.nos)	Value (Rs.crore)	Quantity (Mn.nos)	Value (Rs.crore)
Seat belts	1.92	96.00	5.19	259.50	7.45	372.50
Webbing	*5.76 mn.mtrs*	*9.22*	*15.57 mn.mtrs*	*24.91*	*22.35 mm.mtrs*	*35.76*

- Automobile industry is on fast track with the entry of major global players in India.
- Demand for seat belts has increased after issuance of government notification under Central Motor Vehicle Regulation stipulating that all four wheelers should be equipped with front and rear seat belts. As per Supreme Court Notification, all State governments are expected to ensure that the driver and co-driver use the seat belts.
- **Committee has recommended the need to enforce the law of mandatory use of seat belts in four wheeler vehicles in all states**.
- Technical textile portion in the seat belt is the webbing which is entirely imported. There is not a single indigenous producer of seat belt webbing in the country.
- Thus there are opportunities for setting up seat belt webbing unit for import substitute.
- India can emerge as a global player of seat belts, since it is an assembly operation and labour cost is cheap in India.
- Market size of seat belt webbing is anticipated to grow at Compound Annual Rate of Growth of 9.46 percent during the period 2003-04 to 2007-08.

5.7. Sanitary Napkins

Product	Market size (Estimated)				Potential market size	
	2001-02		2003-04		2007-08	
	Quantity (Mn.nos)	Value (Rs.crore)	Quantity (Mn.nos)	Value (Rs.crore)	Quantity (Mn.nos)	Value (Rs.crore)
Sanitary napkins	960	336	1228	430	1997	699
Nonwovens used in sanitary napkins	*719 tonnes*	*8.32*	*920 tones*	*10.62*	*1496 tonnes*	*17.27*

- High potential for growth
- The spunbond nonwoven is the major raw material. However, thermal bond nonwoven is used for expensive napkins. However, only for 70 percent of napkins non-woven is used, while for remaining 30 percent ultra thin perforated plastic film is used.
- Penetration level of only 20 percent in urban areas which is expected to grow considering improvement in affordability due to increase in number of working women and hygiene awareness.
- In the rural and urban areas there is lack of awareness about the hygiene advantages and conventional substitutes continue to be in the use. However with the expansion of TV network in the semi-urban and rural area awareness is increasing.
- Currently market dominated by the MNCs, which are selling napkins at very high rate.
- It would be feasible to realise the market potential of Rs.699 crore by 2007-08 provided the product is made available in the urban, semi-urban and rural areas at an affordable price.
- **Committee has recommended for dereseravtion of sanitary napkins**.

5.8. Incontinence diaper s / baby diapers

Product	Market size (Estimated)				Potential market size	
	2001-02		2003-04		2007-08	
	Quantity (Mn.nos)	Value (Rs.crore)	Quantity (Mn.nos)	Value (Rs.crore)	Quantity (Mn.nos)	Value (Rs.crore)
Incontinence diapers	3.50	20	8.99	53.96	22.51	135.07
Nonwovens of incontinence diapers	*33 tonnes*	*0.36*	*85 tonnes*	*0.93*	*212 tonnes*	*2.33*
Baby diapers	53.85	70	61.65	80.14	80.81	105.05
Non-wovens for baby diapers	*162 tonnes*	*1.78*	*185 tones*	*2.03*	*242 tonnes*	*2.67*

Incontinence diapers

- The spunbond nonwoven is the major raw material. However, thermal bond nonwoven is used for expensive napkins.
- Currently imported by MNCs in bulk and repacked in small size for domestic sales;
- High cost of product, lack of awareness about its utility and limited availability in few leading chemists shops in the major towns are the reasons for low level of penetration.
- The spunbond nonwoven is the major raw material. However, thermal bond nonwoven is used for expensive napkins.
- The current market size of about Rs.54 crore represents just 0.2 percent of the urban senior citizen market.
- Potential for growth provided prices are brought down and marketing and distribution system strengthened all over the country.
- **Committee has recommended for dereseravtion of incontinence diapers**.

Baby diapers

- The spunbond nonwoven is the major raw material. However, thermal bond nonwoven is used for expensive napkins.
- Baby diapers growing in popularity due to increase in working woman / double income families and awareness about hygiene and convenience.
- **Committee has recommended for dereseravtion of baby diapers**.

5.9. Health care disposables (caps, masks, gowns, beddings etc.)

Product	Market size (Estimated)				Potential market size	
	2001-02		2003-04		2007-08	
	Quantity (tonnes)	Value (Rs.crore)	Quantity (tonnes)	Value (Rs.crore)	Quantity (tones)	Value (Rs.crore)
Non-woven healthcare disposables	-	3.20	-	11.15	-	120.24

- High potential for growth provided produced in a cost effective manner and aggressive marketing and promotional efforts to create the awareness about the benefits of non-woven disposable.
- Nonwoven used for healthcare disposables are spunbond, spunlace and SMS.
- India emerging as a favoured medical tourist destination would encourage use of non-woven disposables.
- With higher hygiene awareness in hospitals, the safety factor of disposables nonwovens is extremely appealing
- Single use nonwovens eliminate the potential for problems associated with the disposal of potentially infected liquids or waste-water.
- Annual expenditure on the linen can be brought down by use of disposable non-wovens.
- Considering all the above factors, the market size of non-wovens is expected to increase from Rs.11 crore in 2003-04 to Rs.120.24 crore in 2007-08.

5.10. Soft luggage material

Product	Market size (Estimated)				Potential market size	
	2001-02		2003-04		2007-08	
	Quantity (mn.mtrs)	Value (Rs.crore)	Quantity (mn.mtrs)	Value (Rs.crore)	Quantity (mn.mtrs)	Value (Rs.crore)
Soft luggage	-	450	-	600	-	1000
Fabric laminated/coated	5	60	7	84	11.5	138

- The luggage industry consists of hard and soft luggage; Hard luggage is made by plastic molding and are large in sizes whereas soft luggage is made out of woven fabric of nylon or polyester and are found to be more convenient than hard luggage and is getting more and more popular;
- In view of the growing market and the export prospects, soft luggage industry of India is poised for major expansion, thus emerging as manufacturing hub for major global markets;
- Non-availability of quality fabrics at competitive prices leads to imports. Hence there is a potential for setting up integrated fabric making unit comprising weaving, processing, PVC / PU / acrylic lamination/coating to ensure supply of coated fabrics of standarised quality at economic prices to the soft luggage industry.
- The market of soft luggage is expected to grow at the CAGR of 14 percent.

5.11. Polyolefin (HDPE/PP) Woven sacks

Product	Market size (Estimated)				Potential market size	
	2001-02		2003-04		2007-08	
	Quantity (lakh tonnes	Value (Rs.crore)	Quantity ((lakh tonnes)	Value (Rs.crore)	Quantity (lakh tones	Value (Rs.crore)
Polyolefin (HDPE/PP) Woven sacks	4.50	2925	5.70	3705	9.10	5915

- HDPE/PP woven sacks belong to the fast changing plastic era as a replacement to traditional jute and paper bags.
- HDPE/PP woven sacks have almost captured the full market of fertilizers, cement and chemical industry. Further, new products are being added almost everyday where these bags are finding rapid usage.
- Potential for growth for economic size state-of-the art technology units since currently the market is dominated by large number of uneconomic and low technology unit.
- Entry of Reliance as a raw material supplier with greater thrust on product development as well as promotion of products for existing and new application areas has given a big boost to the industry.
- Promising prospects for India to emerge as a major supplier to SAARC and Middle-East countries.

5.12. Hoardings and signages

Product	Market size (Estimated)				Potential market size	
	2001-02		2003-04		2007-08	
	Quantity (mn.mtrs)	Value (Rs.crore)	Quantity (mn.mtrs)	Value (Rs.crore)	Quantity (mn.mtrs)	Value (Rs.crore)
Hoardings and signages	5.00	50.00	8.00	80.00	20.00	200.00

- The market for hoarding and signages is growing at the rate of 20-30 percent per annum due to recently emerged competition in telecom services, banking, insurance sectors, entry of organised private sector into retailing and health care and the technological superiority of fabric signages over the conventional materials;
- Early stage of product introduction in the growth curve denotes long term healthy growth of the industry;
- Currently signage fabrics are imported to significant extent. Expansion of production base using state of the art technology with economic size plants would curtail the import of fabrics.

5.13. Shade fabrics

Product	Market size (Estimated)				Potential market size	
	2001-02		2003-04		2007-08	
	Quantity (tonnes)	Value (Rs.crore)	Quantity (tonnes)	Value (Rs.crore)	Quantity (tonnes)	Value (Rs.crore)
Shade fabrics	780	9.00	1650	20.00	8250	99.00
non-woven crop covers	2000	25.00	2640	33.06	4670	58.00
Mulch mats	13	1.00	105	1.50	400	5.70

- Shade fabrics are used for green houses as well as for horticulture application.
- Though present usage is limited, the awareness about the beneficial usage of shade fabrics in terms of better crops and higher returns is increasing resulting in leading manufacturers, witnessing annual sales growth of 35-50 percent.
- With aggressive promotional measures, there is tremendous growth potential for shade fabrics.
- Non-woven crop covers are generally produced using the spun bonding techniques. These non-wovens are both air and water permeable and can be laid right on the plants unlike plastic covers that can burn any leaves that touch them.
- Mulch mats are used for conserving soil moisture during rainless period and also for weed control in horticulture operation. Since the use of mulch mats invariably leads to better crops, its usage is increasing.
- The new projects in the Agri-export processing zones for horticulture and floriculture would provide impetus for adoption of new generation techniques for maximizing crop yields.

5.14. Sports footwear

Product	Market size (Estimated)				Potential market size	
	2001-02		2003-04		2007-08	
	Quantity (mn.pairs)	Value (Rs.crore)	Quantity (mn.pairs)	Value (Rs.crore)	Quantity (mn.pairs)	Value (Rs.crore)
Sports footwear	570	5100	595	5950	804	8040
Tech.Textile shoe components	*105 mn. mtr.*	*1020*	*120 mn mtr.*	*1200*	*140 mn. mtr.*	*1600*

- In sports foot wear about 20 percent of the components used are textiles like shoe uppers, linings, labels etc.
- Currently production is predominantly in the decentralised sector of sub-standard quality.
- Since standardization of components and finished products is necessary for India to become major supplier of sports wear, footwear and Design Development Institute, Noida has to play important role in standardization.
- Unit set up in the organised sector can tap export potential with India emerging as a manufacturing base for sports wear.
- Good potential for units manufacturing technical textile sports footwear component set up with appropriate technology with strict adherence to quality standards and low cost of production.

5.15. Non-woven glass mat for Battery separator

Product	Market size (Estimated)				Potential market size	
	2001-02		2003-04		2007-08	
	Quantity (mn.sq.mtrs)	Value (Rs.crore)	Quantity (mn.sq.mtrs)	Value (Rs.crore)	Quantity (mn.sq.mtrs)	Value (Rs.crore)
Non-woven glass mat for Battery separator	8.83	23.00	11.88	30.93	21.63	56.33

- Non woven glass mats are mainly used in industrial batteries and in some cases in automobile batteries.
- The growth potential for non-woven glass mats is linked with growth of industrial and automobile batteries which is expected to grow at 10 to 12 percent per annum.
- Currently, requirement for non-woven glass mat is met through imports from Europe, Japan and Thailand.
- There is a good potential for import substitution. Therefore, opportunities for suitable size non-woven glass fibre mat project needs to be explored.

5.16. Velcro

Product	Market size (Estimated)				Potential market size	
	2001-02		2003-04		2007-08	
	Quantity (mn.mtrs)	Value (Rs.crore)	Quantity (mn..mtrs)	Value (Rs.crore)	Quantity (mn..mtrs)	Value (Rs.crore)
Velcro	250	120	280	145	314	212

- Demand for Velcro tapes are governed by the production trends in the user industries like garment, foot wear, luggage, home furnishing, health care etc.
- The growing demand for end user industries is resulting into growing demand for Velcro tapes at CAGR of 10 percent.
- There is a high potential for setting up unit based on imported technology and with economies of scale to tap global as well as Indian markets.

5.17. Computer ribbons

Product	Market size (Estimated)				Potential market size	
	2001-02		2003-04		2007-08	
	Quantity (mn.sq.mtrs)	Value (Rs.crore)	Quantity (mn.sq.mtrs)	Value (Rs.crore)	Quantity (mn.sq.mtrs)	Value (Rs.crore)
Computer ribbons	3	30	5.1	51	14.5	145

- There is a limited domestic supply of printer ribbon fabric. Most of the demand is met through imports.
- With automation and computerisation of Bank branches, reservation system for Railways, State Transport undertakings and Revenue Department to issue land records etc., the demand for computer ribbons is showing an increasing trend.
- Market for printer ribbon depends on the market for printers which is showing a very good growth rate. There is a potential scope for setting up a plant for fabric required for printer ribbon/refill.
- The market size of computer ribbon is expected to register a Compound Annual Growth Rate of 30 percent.

5.18. Airbags

Product	Market size (Estimated)				Potential market size	
	2001-02		2003-04		2007-08	
	Quantity (mn.nos)	Value (Rs.crore)	Quantity (mn.nos)	Value (Rs.crore)	Quantity (mn.nos)	Value (Rs.crore)
Air bags	0.02	10	0.05	25	1.448	724
Technical Textile Component	-	1	-	2.5	-	72.40

- Technical Textile component constitute about 10 percent of the value of the air bag.
- Though India has made significant progress in the manufacture of car, not a single car made and sold in India has Air bag system. However, for car exported from India, where Air bag installation is mandatory, supply are met through imports.
- Market potential for Airbags is linked to the introduction of mandatory changes. **The Committee has recommended that installation of airbags should be made mandatory in new cars**.
- Now that India has the presence of most of the global players of car manufacturers, it is an opportune time to initiate policy efforts for air bags usage in the passenger cars. This aspect becomes more relevant for high speed driving on the new highways under construction connecting the North-South and East-West.

5.19. Fibre Fill

Product	Market size (Estimated)				Potential market size	
	2001-02		2003-04		2007-08	
	Quantity (000 tonnes)	Value (Rs.crore)	Quantity (000 tonnes)	Value (Rs.crore)	Quantity (000 tonnes)	Value (Rs.crore)
Fibre Fill	48	288	60	360	95	570

- Cotton has been traditionally used as a filling material in India. However, in a recent period, special synthetic fibre known as fibre fill has been developed as an alternative to cotton for filling purposes.
- The present level of penetration is extremely low due to low level of product awareness and lack of knowledge about the desired performance characteristics in comfort products.
- Reliance Industries Ltd. is the only producer of hollow fibre fill in the country and is promoting fibre fill aggressively through its distribution chain.
- The target product segment would be pillows, baby mattresses, stuffed bags, quilts etc.
- Growth potential for modular units set up for supply of finished products at important consumption centres in major towns.
- The fibre fill is expected to register a CAGR of 12 percent.

5.20. Stuffed Toys

Product	Market size (Estimated)				Potential market size	
	2001-02		2003-04		2007-08	
	Quantity (000 tonnes)	Value (Rs.crore)	Quantity (000 tonnes)	Value (Rs.crore)	Quantity (000 tonnes)	Value (Rs.crore)
Stuffed toys	-	60	-	66		96

- Domestic market is not well developed as the buyers are not aware of different qualities available in soft toys.
- There is constraint in raw material availability of good quality fur fabrics.
- Production base of stuffed toys is characterized by number of cottage scale units with low technology.
- The market can be expanded through promotional measures and reasonable prices targeting middle income groups.
- The market of stuffed toys is expected to register a CAGR of 10 percent.

5.21. Filters

Product	Market size (Estimated)				Potential market size	
	2001-02		2003-04		2007-08	
	Quantity (tonnes)	Value (Rs.crore)	Quantity (tonnes)	Value (Rs.crore)	Quantity (tonnes)	Value (Rs.crore)
Filters	-	260	-	297.60	-	386.29
Filter fabric	-	*81*	-	*95*	-	*132*

- Filters are classified in two groups i.e., dry (air / dust) and wet filter
- Major application of air filters are in ventilation and air conditioning system, paint booth (automobile and consumer durable products), pharmaceutical sectors (formulation and basic drugs) power generation, air compressors, automobiles, electronic components, industrial vacuum cleaners.
- The dust filters are used in cement plants, metallurgy or steel industry, thermal power plants, textiles, fertilizers/pesticides industry.
- The wet filters are used in industries like sugar, soft drinks, pharmaceuticals, paints, dye stuffs as well as in engineering industry.
- The market potential for filters will depend on new projects likely to be set up in different end user industry group and also for certain sectors there would be recurring replacement demand.
- The market for filters is expected to grow at CAGR of 6 percent.

5.22. Zip fasteners:

Product	Market size (Estimated)				Potential market size	
	2001-02		2003-04		2007-08	
	Quantity (Mn.mtrs)	Value (Rs.crore)	Quantity (Mn.mtrs)	Value (Rs.crore)	Quantity (Mn.mtrs)	Value (Rs.crore)
Zip fasteners	75	300	95.10	380.40	143.50	574

- Zip fasteners are extensively used in the luggage industry, readymade garment industry and footwear industry.
- End user market is increasing, pulling the demand for zip fastener also.
- Potential for suitable capacity unit with imported technology to ward off threat of imports.
- The market for zip fastener is expected to register a growth of 11 percent .

5.23. Balloon fabric & Parachute fabric

Product	Market size (Estimated)				Potential market size	
	2001-02		2003-04		2007-08	
	Quantity (Mn.mtrs)	Value (Rs.crore)	Quantity (Mn.mtrs)	Value (Rs.crore)	Quantity (Mn.mtrs)	Value (Rs.crore)
Balloon fabric	-	0.5	-	0.61	-	0.89
Parachute fabric	-	4.50	-	6	-	10.67

- Balloons are used for applications like advertising, sports and recreational activities, transporation etc.
- Balloon fabrics have been developed in India for DRDO but volumes are insignificant.
- Parachutes are used for different functions such as material dropping, man dropping, bomb dropping and ammunition dropping.
- Parachutes are high value item and defense is the major buyer.
- Long term domestic and export prospects for air balloon fabric and parachute fabrics.
- Hot air ballooning fabric and parachute fabric are expected to register a CAGR of 10 percent, and 15 percent respectively.

5.24. Fire Retardant fabric:

Product	Market size (Estimated)				Potential market size	
	2001-02		2003-04		2007-08	
	Quantity (Mn.mtrs)	Value (Rs.crore)	Quantity (Mn.mtrs)	Value (Rs.crore)	Quantity (Mn.mtrs)	Value (Rs.crore)
Fire Retardant fabric	-	197.50	-	295.25	-	763.50

- Serge fabrics currently used by fire brigades do not serve the purpose as they are not flame retardant.
- Use of aramide or other specialty fibre which satisfy flame retardancy criteria are necessary for uniforms of fire brigades.
- Strict compliance of National Building Code of India (NBC) which stipulates compliance with minimum standards for fire safety necessary in public interest.
- **The Committee has recommended mandatory use of fire retardant fabrics in public places irrespective of the number of persons as stipulated in NBC**.
- There is also need for awareness creation of FR furnishing fabrics for safety.
- The mandatory stipulation and awareness creation would create market potential for fire retardant fabrics to the extent of Rs.763.50 crore by 2007-08.

5.25. Ballistic protective clothing

Product	Market size (Estimated)				Potential market size	
	2001-02		2003-04		2007-08	
	Quantity (nos)	Value (Rs.crore)	Quantity (nos)	Value (Rs.crore)	Quantity (nos)	Value (Rs.crore)
Ballistic protective clothing	50,000	150	75,000	225	1,75,000	525

- The aim of ballistic clothing is to prevent bullets or other projectiles such as flechelets or bomb fragments from piercing the body. Ballistic protective clothing has two major user segments i.e., military and police for vests and bulletproof jacket.
- Highly restrictive demand due to budgetary constraints. However, demand is bound to increase due to the internal security problems and security for VIPs, business men etc.
- There is a good potential for export to neighbouring country. The market for ballistic protective clothing is likely to grow at a CAGR of 23 percent.

5.26. *Surgical dressings*

Product	Market size (Estimated)				Potential market size	
	2001-02		2003-04		2007-08	
	Quantity (tonnes)	Value (Rs.crore)	Quantity (tonnes)	Value (Rs.crore)	Quantity (tonnes)	Value (Rs.crore)
Surgical dressings	-	450	-	520.03	-	694.48

- Surgical dressings are primarily made out of woven fabrics and non-woven substrates that have cotton and viscose as the base raw materials.
- Surgical dressings are mainly used as protective coverings at wound sites or for swabbing / cleaning of infected sites and have been designed and developed to meet certain end applications by using liners by way of adhesives or paddings duly medicated.
- Surgical dressings include wound care products and bandages.
- Wound care products include wound contact layer / absorbent pad / base material / non-adherent dressings / perforated films.
- Bandages include inelastic bandages / elastic bandages / light support bandages / orthopedic cushion bandages / plasters / waddings / gauzes / lint.
- Surgical dressings industry is concentrated in the cottage and decentralized sector using obsolete technology.
- Opportunities exist for composite high-tech units for manufacture of range of surgical dressings.

5.27. *Food-grade jute bags.*

Product	Market size (Estimated)				Potential market size	
	2001-02		2003-04		2007-08	
	Quantity (tonnes)	Value (Rs.crore)	Quantity (tonnes)	Value (Rs.crore)	Quantity (tonnes)	Value (Rs.crore)
Food-grade jute bags.	5118	17.96	8300	29	12650	44.28

- IJIRA has recently developed food grade jute bags under Rice Bran Oil (RBO) technology which is suitable for packing all types of edible commodities.
- The cocoa and coffee producing countries are the most potential markets for these bags and hessians cloth.
- Although food grade jute bag is a better substitute than the traditional bag, the price factor is an important consideration.
- There should be incentive for exporting the food grade jute bags. Export market assistance (EMA) for this category may thus be suitably enhanced to maintain the differential with traditional packaging in products.
- A food grade level needs to be devised which distinguishes Indian food grade jute bags manufactured with RBO technology from the other food grade bags.
- A large potential market exists for food grade jute bags in India and abroad.

5.28. Spunbond nonwoven

Product	Market size (Estimated)				Potential market size	
	2001-02		2003-04		2007-08	
	Quantity (tonnes)	Value (Rs.crore)	Quantity (tonnes)	Value (Rs.crore)	Quantity (tonnes)	Value (Rs.crore)
Spunbond nonwoven	-	13.65	-	24.74	-	111.28

- Currently demand for spunbond nonwoven is primarily met through imports as the existing two units are 100 percent EOUs.
- Spun bond non-woven fabric has number of applications in sanitary and hygiene, medical and surgical and other miscellaneous applications like agriculture etc.
- With increase in conversion activity of sanitary napkins, incontinence diapers, baby diapers and healthcare disposals the demand for spunbond is expected to increase significantly.
- The total market for spun bond fabrics from various application areas is expected to increase from Rs.24.74 crore in 2003-04 to Rs.111.28 crore in 2007-08.

5.29. Tafetta cloth

Product	Market size (Estimated)				Potential market size	
	2001-02		2003-04		2007-08	
	Quantity (tonnes)	Value (Rs.crore)	Quantity (tonnes)	Value (Rs.crore)	Quantity (tonnes)	Value (Rs.crore)
Tafetta cloth	490	9.13	540	10.00	940	17.50

- Taffeta fabrics are used extensively for a large number of applications like umbrella, windcheater, sleeping bags, kites, artificial flowers, substrate for coatings, lining, courier bags etc.
- These fabrics are made from nylon and polyester filament yarns and internationally accepted as 190T, 210T, and 230T material where T indicates the thread density of fabrics.
- Presently huge quantity of taffeta fabrics are being imported from China, South Korea, Taiwan, Indonesia because of cost. It is observed that the quality produced in the mills located at Surat is extremely poor as they are produced on shuttle looms.
- The project on production of grey taffeta fabrics can contain import and impasse self sufficiency to a greater extent for mass consumption product with global quality standard.
- There is a scope of exporting these fabrics.

Products identified for preparation of project profiles

5.30. Subsequent to identifying 25 products, the committee thought it prudent to short list the 11 products for the purpose of making project profiles for encouraging investment in these products. The committee decided first of all that potential products may be identified, then the technology most economical to produce identified products should be listed out and thereafter other products which could be produced from this technology either without any modification

with the machinery or with some modification in the machinery should be listed out.

5.31. Considering the importance of geotextiles the committee shortlisted 2 product groups of geotextiles, i.e., needle punch non-woven and geogrid technology. Further non-wovens being an important segment for India, committee short-listed two more technology for producing non-wovens, i.e., spun lace non-woven and spun bond non-woven projects. Conversion activity of non-wovens was also considered an important activity particularly for medium scale investors, therefore committee short-listed four products of conversion activity i.e., Sanitary Napkins, Incontinence diapers, Baby diapers and health care disposables. Other projects selected by committee-included seat belt webbing project, which is an import substitute project. The taffeta fabric project, coated fabric project, compression garments project and surgical dressing project were short-listed by the committee considering their market potential. The identified 11 products alongwith rationale for selecting these products is given below :

Sr. No.	Name of the project	Rationale for identification
1.	Needle Punch project	♦ Geotextiles has extremely good potential in view of the government thrust on development of infrastructure. During the period 2003-04 to 2007-08 the market size for geo textiles has been placed at Rs.6291 crore. Needle punch would be predominantly used for geotextiles. ♦ In addition to geo textiles other end uses of needle punch nonwoven fabrics are carpets, head liners, filtration, felts etc. which are also expected to register significant growth.
2.	Geo-Grid project	♦ Geo grids are also used for projects related to infra structure development which is the thrust area for the government. Geo grids are used for reinforcement applications like reinforcement of steep slopes, embankment of soft soils, stabilisation of shallow clay slopes, Gabian for wall construction and as asphalt reinforcement in pavements. ♦ The market potential for geo grid is estimated to be Rs.609 crore during the period 2003-04 to 2007-08.
3.	Seat belt webbing project	♦ Seat belt webbing is an import substitute product. There is not a single producer of seat belt webbing in the country. ♦ The mandatory stipulation of seat belts in the four wheelers has increased the demand for seat belts. Accordingly, demand for seat belt webbing has increased. ♦ The demand for seat belt webbings is expected to increase from 15.57 mn.mtrs. valued at Rs.24.91 crore in 2003-04 to 22.35 mn.mtrs. valued at Rs.35.76 crore in 2007-08.
4.	Taffeta fabric	♦ Taffeta fabrics are used extensively for a large number of applications like umbrella, windcheater, sleeping bags, kites, artificial flowers, substrate for coatings, lining, courier bags etc. ♦ Presently huge quantity of taffeta fabrics are being imported from China, South Korea, Taiwan, Indonesia because of cost. The project on production of grey taffeta fabrics can contain import and impasse self sufficiency to a greater extent for mass consumption product with global quality standard. ♦ There is a scope of exporting these fabrics.

Sr. No.	Name of the project	Rationale for identification
5.	Coated fabric	♦ Coated fabrics form one of the most important segment of the technical textiles. Coating operations are carried out to impart certain characteristics and desirable properties for the end use application of the product. ♦ The global market for coated fabric valued at US $8.26 bn. in 2000 is expected to increase to US $ 9.7 bn. by 2005. The Asia Pacific region is expected to reflect much higher growth rates with China and India emerging as a target markets. ♦ The India coated fabric market segment which is at a take off stage has the potential to become manufacturing base to meet the growing domestic market and also emerge as a exporter to developing countries.
6(a)	Conversion activity of Sanitary Napkins	♦ High potential for growth of sanitary napkins. ♦ Currently the Indian market is dominated by MNCs which are selling at high prices. ♦ Due to the high prices, urban penetration is very low to the extent of 20 percent while penetration in the rural area is almost nil. ♦ Reasonably priced sanitary napkins produced indigenously could result in high penetration of the market ♦ The market size of sanitary napkins is expected to increase from Rs.430 crore in 2003-04 to Rs.699 crore in 2007-08. Correspondingly, demand for non-woven would increase from Rs.10.62 to Rs.17.27 crore during the corresponding period.
6(b)	Conversion activity of Incontinence Diapers.	♦ There is a very good potential for Incontinence Diapers. ♦ Currently the Indian market is dominated by MNCs, which import the incontinence diapers and repack it in the smaller size for sale at high prices. ♦ Currently, the Indian market is very small due to the low level of awareness coupled with prevalent high prices. ♦ Indigenous production with reasonably priced output would improve the market demand. ♦ The market size is expected to increase from Rs.54 crore in 2003-04 to Rs.135 crore in 2007-08. Correspondingly consumption of non-woven would increase from Rs.0.93 crore to Rs.2.33 crore.
6(c)	Conversion activity of baby diapers	♦ Market offers immense potential ♦ With increase in working woman and double income families and increasing awareness of hygiene and advantages of convenience in using disposable diapers is bound to have positive impact on the market. ♦ The demand for baby diapers is expected to increase from Rs.80 crore in 2003-04 to Rs 105 crore in 2007-08. Correspondingly consumption of nonwoven would increase from Rs.2 crore to Rs.3 crore.

Sr. No.	Name of the project	Rationale for identification
7.	Conversion activity of Health care disposable	♦ Non-woven disposable to woven reusable items in terms of cost effectiveness, hygiene and low post operational rate of infection. ♦ Non-woven which have found acceptance in the western countries are yet to make significant impact in the Indian market. ♦ However, the market is slowly and steadily increasing with the growing awareness about the beneficial and cost effective nature of the non- woven. ♦ The demand for non-woven disposable is expected to increase from Rs.11 crore in 2003-04 to Rs.120 crore in 2007-08.
8.	Spun bond project	♦ Currently demand for spunbond nonwoven is primarily met through imports as the existing two units are 100 percent EOUs. ♦ Spun bond non-woven fabric has number of applications in sanitary and hygiene, medical and surgical and other miscellaneous applications like agriculture etc. ♦ With increase in conversion activity of sanitary napkins healthcare disposals the demand for spunbond is expected to increase significantly. ♦ The total market for spun bond fabrics from various application areas is expected to increase from Rs.24.74 crore in 2003-04 to Rs.111.28 crore in 2007-08.
9.	Spun lace project	♦ Spun lace process is considered to be a highly versatile process because it can be used to produce non-woven with a broad range of end use property. ♦ Spun laced fabric have a wide use in various applications due to relatively high absorption abilities and absence of a binder in the fabric allowing sterilization of the fabric at high temperature. Application areas are wipes, cosmetic cotton pads, surgical gown drapes, soft luggage material, garment-interlining etc. ♦ The market for spun lace fabric is expected to increase from Rs.32.28 crore in 2003-04 to Rs.242.69 crore in 2007-08.
10.	Compression garment project.	♦ Different type of compression garments i.e., knee calf and ankle support, neoprene support, back support, cervical aids, traction kit and spares, wrist and elbow support, fracture aids, sport goods for rehabilitation and general aid can be produced on circular warp knitting machine. ♦ Currently, market is small because of low level of awareness and high priced imported goods. The market is expected to welcome new product range provided they are price-wise competitive. ♦ The promotion of these products would increase the demand significantly. ♦ The market size is expected to increase from Rs.50 crore in 2003-04 to Rs.71 crore in 2007-08.
11.	Surgical dressing project	♦ Surgical dressings are primarily made out of woven fabrics and non-woven substrates that have cotton and viscose as the base raw materials. ♦ Surgical dressings include wound care products and bandages. ♦ Surgical dressings industry is concentrated in the cottage and decentralized sector using obsolete technology. ♦ Opportunities exist for composite high-tech units for manufacture of range of surgical dressings. ♦ The market size is expected to increase from Rs.520.03 crore in 2003-04 to Rs.694.48 crore in 2007-08.

5.32. The committee requested TECS to prepare the Project Profiles for the 10 items short-listed except S.No.4 above. TECS prepared project profiles for 10 items and for taffeta fabric project profile was made by M/s. Kusumgar Corporates. The project profiles were prepared by the TECS in its 2nd Phase of study. The Project Profiles interalia include details of MES, basic minimum configuration of machinery, suppliers of machinery, market size for each application, specification / standards required to be met, type of raw materials, supply of raw materials, demand supply position, investment profitability etc. The TECS phase II report giving the Project Profiles is at **Appendix – 5A** and project profile made by M/s. Kusumgar Corporates is at **Appendix – 5B**. Further, SASMIRA was requested to give project profiles on 7 projects, i.e., agro shade net project, fibrefill project, industrial filter fabrics project, woven geotextiles project, safety and protective textiles project, shoe uppers project and double needle bar spacer project which are appended as **Appendix - 5C**.

5.33. The project cost and financial parameters of the 10 products are worked out by the TECS based on certain assumptions which are detailed out in the Phase II report of the TECS. The ECTT had also constituted sub-committees for each project profile comprising of major producers of respective items to vet those profiles. The profiles were only accepted by the committee after approval of the respective sub-committees (except profile of surgical dressings). **Still, the investors need to do detailed research on the project considering their own strength and capabilities before deciding on investing in a particular project**.

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CHAPTER - 6

INSTITUTIONAL MECHANISM FOR PROMOTION OF TECHNICAL TEXTILES

The Committee is of the view that India with its vast resources, capabilities and expertise has the potential to exploit the emerging opportunities in the field of technical textiles provided conducive environment for investment in technical textiles is created in the country. To encourage and sustain the growth of the technical textile industry, a strong network of institutional mechanism needs to be created.

Inter-Ministerial Committee *:*

6.2 Technical textiles has never been a single coherent industry sector and market segment is also diverse and broad based. Its usage is already in diverse industries and is developing in other industries also. The Committee noted the lack of co-ordination not only amongst the different Ministries but also among the institutions coming under the purview of the same Ministry with regard to application / usage of technical textiles. For example, CRRI has significant expertise / experience of geo-textiles and also has well developed testing facilities, but Ministry of Transport & Highways is neither making use of the expertise / experience of CRRI nor its testing facilities. Therefore, an Inter-Ministerial Co-ordination Committee under the Ministry of Textiles needs to be set up for co-ordinating follow up action by different Ministries and other institutions.

6.3 The committee in its interim report submitted to the Ministry of Textiles in August, 2003 has suggested setting up of Inter-Ministerial Committee (IMC). Accordingly, the Government constituted a committee vide its OM dated 30.12.2003 under the Chairmanship of Secretary (Textiles). The IMC comprises representatives of Planning Commission, TRAs and user Ministries, (i.e., Health and family welfare, Transport and Highways, Chemicals and Petrochemicals, Water Resources, Railways, Defence and Home Affairs etc.). A copy of the OM of the Ministry of textiles constituting the committee is at **Appendix – 6A**.

6.4 The IMC would co-ordinate the implementation of action plan recommended by ECTT and take necessary follow up action. The hindrances and problems experienced by the different Ministries in implementation of the action plan would also be sorted out by the IMC.

Centres of Excellence*:*

6.5 The Committee is of the view that a few Centres of Excellence may be set up on the lines of such centres established in U.K. for facilitating growth of the

diverse segments of the technical textile industry. In U.K. 2-4 centres of excellence have been set up by the Govt. by entrusting each centre a separate product, e.g., Leads Institute for Nonwovens such as, geo textiles, Bolton Institute for heat barrier material, medical textiles etc. It is also ensured that there is no duplication of developmental work and R & D in such centres of excellence. In addition to centres of excellence, the committee is of the view that a nodal agency to coordinate the activities of centres of excellence may be set up.

Centres of Excellence

6.6 The committee thought it appropriate to identify centres of excellence on segmental or geographical basis in view of the fact that technical textiles activities involve broad based and diverse user segments. The basic objective of creation of centres of excellence is to provide infrastructure support at one place for the convenience of the manufacturers of technical textiles.

6.7 The Centres of Excellence should have suitable space, infrastructure, manpower and administrative facilities to carry out their functions. The essential facilities to be created in the Centres of Excellence are as follows:

- **Facilities for testing and evaluation of technical textiles for which they are developed as a Centres of Excellence.**
- **Developed as a national and international accreditation center.**
- **Development of Resource Centre with I.T. infrastructure.**
- **Facilities for indigenous development of prototypes.**
- **Facilities for training of core personnel.**
- **Facilities for regular training of personnel from the industry**
- **Creating awareness.**

Facilities for testing and evaluation of technical textiles :

6.7.1 The committee observed that one of the biggest draw backs hindering the growth of the industry was lack of specialized testing and evaluation facilities in different application areas of technical textiles. Such testing facilities have to be of international standards, as any shortcoming of the performance criteria will involve failure of end use equipment leading to even loss of human life and property. Setting up of testing facilities of technical textiles as per international standards like ASTM, BS, DIN, ISO, EN, etc. will definitely go a long way in enabling the entrepreneur to face the challenges of the global competition.

6.7.2 Test facilities of state-of-the-art technology should be created in Centres of Excellence in the country of their respective areas. The proposed testing facilities

should cater to the requirements of testing the final product but also the fibre, yarn, fabrics and other elements that go into final product.

6.7.3 In-house testing facilities would be set up by financially sound entrepreneurs for meeting the day to day testing requirements of their project. However, common testing facilities need to be created for a particular product / segment in Centres of Excellence covering all the facilities including ones which are required on day-to-day basis particularly for SMEs. It would also be ensured that testing facilities set up in the Centers of Excellence are of international standards and are able to test the parameters as per international standards.

6.7.4 A list of common testing facilities suggested by TECS for identified 25 products is at **Appendix-6B**. These common testing facilities could be created in the centres of excellence for respective products. However, the professional agency as suggested by committee vide para 6.8 may examine and evaluate this list before implementing the same in the centres of excellence.

National and International Accredition Centre

6.7.5 The testing laboratories of centre of excellence should get the national accredition by NABL.

6.7.6 Technical textiles are functional textiles Therefore, stringent performance parameters have been prescribed by the international agencies and these standards are required to be met by the exporting units before these products are accepted in the international market. Therefore, centres of excellence should purchase the standards for the respective products and set up the test laboratories for testing of those standards and also get their testing labs accredited by international agencies so that their test results are accepted in the international arena.

6.7.7 The committee noted that CE marking is essential for medical devices and geo-textiles for export to European countries. Committee recommends that centre of excellence for such products should take accredition for awarding CE certificate to the Indian companies.

Development of Resource Centre with I.T. Infrastructure

6.7.8 Technical textiles involves emerging new technologies for which sufficient literature, reference material, samples, specifications, norms directives, etc. are not available in the country. While India has the benefit of support from mature technologies in the Western World, India would have to quickly master the

technology from almost a 'no where position' to reach a reasonable level of competence in order to compete in the domestic as well as global market within a short span of time.

6.7.9 The information resource centre of Centre of Excellence should be equipped with technical literature, reference material, books, a sample bank containing sample of various products and information about manufacturing production, standards, testing procedures etc. Centres of excellence may in fact serve as a 'knowledge and reference base' for technical textile entrepreneurs.

6.7.10 Committee also recommends that an exclusive website on technical textiles should be developed and maintained by all Centers of Excellence. These sites should provide link to each other as well as other sites including international sites with information on technical textiles.

6.7.11 Since technical textiles involve value – added products of diverse user segments, the literature, books, specifications, directives, samples, etc are highly expensive. Besides infrastructure for I.T., documentation, modern methods and gadgets for storage, retrieval and recording of information also will have to be a part of the centre. The appropriate fund requirement for development and maintenance of resource center may be provided by the Govt.

Facilities for indigenous development

6.7.12 To provide back up support to the industry, complex products of technical textiles in emerging areas need to be developed on a pilot scale and the technology should be transferred to the industry after standardization and optimisation of the production process.

6.7.13 Pilot and laboratory scale facilities should be created at Centres of Excellence for a particular product / segment of technical textiles dealt with by such centres, depending on the pattern of demand and consumption of technical textiles.

Facilities for training of core personnel (Trainers)

6.7.14 Considering the wide range of discipline in various fields of science and technology involved in technical textiles, it is necessary to impart training to textile technologists, academicians, scientists etc. from TRAs, Institutes and industry to develop a set of core professionals (trainers) dedicated to activities related to technical textiles. Subsequently these core personnel could be required to

train the textile professionals in the country regularly so that there would be no dearth of trained manpower in the field of knowledge based technology of technical textiles in the country.

6.7.15 The Committee recommends that core personnel for a particular product groups / segment should be trained by inviting consultants from abroad. The training must encompass knowledge, technology, and application, and separate modules should be developed for separate groups. The centres of excellence should take the responsibility of training of core personnel of the respective segment.

Regular training of the personnel

6.7.16 The Centers of Excellence should set up the facilities for regular training of the technicians working in the industry in the different areas of technical textiles. Centers of Excellence may also study the requirement of the training from the clusters of the technical textiles coming under their jurisdiction and may set up satellite training facilities in such clusters to facilitate the technicians to attend the training programme.

Creating awareness

6.7.17 The investment in technical textiles can take place by creation of awareness. The respective centres of excellence may arrange road shows, seminars and workshops particularly in the clusters of textile industry to generate interest of the entrepreneurs in the technical textile industry.

Designation of centre of excellence:

6.8 The committee identified TRAs, few reputed institutes and research bodies for the purpose of short-listing them as Centres of Excellence. The committee felt that the basis of allocation of centres of excellence for a particular product should be core competence of each institute in terms of its existing testing equipments, availability of professional personnel and proximity to the cluster of production activity of that product. Accordingly, committee directed TECS to carry out an exercise on the basis of above parameters for suggesting product / product group / segment wise centres of excellence. However, the study report submitted by TECS was not upto the mark and indicated over lapping with regard to products etc. Therefore, committee recommends that a professional agency like BTTG may be appointed by the Govt. to carry out the detailed study for designating the centres of excellence for a particular product / product group / segment. The professional agency may also suggest the required testing equipments and the human resources

requirement and other infrastructure facilities required for such centres of excellence.

Steering Committee for Development and growth of Technical Textiles (SCDGTT).

6.9 The government has designated SASMIRA as a nodal agency for technical textiles. The committee deliberated on the issue of designating the agency as nodal agency and came to the conclusion that considering the primary function of the nodal agency, i.e., to promote the growth of the technical textile industry in the country and to monitor, review and coordinate the activities of the different centres of excellence, it would be appropriate to constitute a committee under the Chairmanship of Textile Commissioner for the purpose. This committee would be able to get the support of all the stake holders in promoting the growth of the technical textile industry and would also be able to monitor, review and coordinate the activities of different centres of excellence in an appropriate manner.

6.10 SASMIRA, a TRA, is on equal footing with other TRAs and institutes which would be designated as a centre of excellence and would not be able to perform the functions of nodal agency effectively particularly that of administrative in nature. The committee noted that SASMIRA was designated as nodal agency when the concept of centres of excellence was not evolved and it was thought that SASMIRA would be able to cater to the needs of entire technical textile industry. However, after going through the existing status of the technical textile industry which is very vast and wide spread in the country, committee came to the conclusion that SASMIRA could be designated as one of the centre of excellence.

6.11 **The committee recommends that a Steering Committee for Growth & Development of Technical Textiles (SCGDTT) may be set up under the Chairmanship of Textile Commissioner to monitor and review the growth of the technical textile industry and also activities of centres of excellence**. The SCGDTT should comprise of directors of all the centres of excellence and should co-opt 10 experts drawn from manufacturers, academics and users of technical textiles. The committee strongly feels the need for such a committee to encourage involvement of industry in focussed development of need based infrastructure support for the different products / segments of the technical textile industry.

6.12 **In order to provide direction for scientific research committee recommends that a sub-committee of SCGDTT under the Chairmanship of Textile Commissioner may be set up with Director, SASMIRA as a Member Secretary**. This sub-committee would work as a Nodal Agency for technical areas, i.e., '**technical think tank**' and should comprise of technical experts drawn from IITs, other institutes and also research agencies of the private sector. The main function of the sub-committee would be providing technical inputs to the SCGDTT in terms of tracking down of the developments in

technology/material/machinery for their relevance to the Indian industry and refinement and application in the country. This sub-committee would also undertake inter-disciplinary liaison with different industry users and also initiate exercise for bringing out the manuals for different technical textile activities.

Funding pattern :

6.13 For setting up of Centres of Excellence initially 100 percent funding could be from the Govt. However, for the developmental work or R&D, the U.K. model of **faraday partnership** should be adopted. Under this system, 50 percent funding is by the Govt. and 50 percent by the industry segment concerned. The latter could also be in kind, such as contribution of man-days, raw material, use of capital equipment etc. The pattern of funding would result in the research agencies taking up the project which are relevant to the industry and there would also be close interaction with industry. The payment to research agencies for particular research projects should also be released on the basis of actual achievement against the delivery road map. This system would make the research agency more responsive. Further, on the line of U.K. system, industry can come to nodal agency / centre of excellence with problems and these agencies will come out with the solutions which would be patented in the name of the party concerned.

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CHAPTER - 7

POLICY SUPPORT FOR PROMOTION OF TECHNICAL TEXTILES

Entrepreneurship in technical textiles is an essential prerequisite for promotion of technical textiles in India. Entrepreneurship in technical textiles demand simultaneous development of products and of their markets with proven performance and cost effectiveness. Entrepreneurship in technical textiles involves challenges in terms of selecting raw materials, machineries, processes and product evaluation and testing to stringent specifications. At the same time, it demands creating markets through constant interaction with users segment to accept the product. Simultaneously the entrepreneur is required to move with the emerging textile technologies and exploring ever increasing application of technical textiles. For Indian Entrepreneur in particular, he has to gain ground lost in the last two decades. He has to compete with Multi National Companies having strength of expertise and experience in technical textiles for two decades with full financial muscle strength. With this background, although technical textiles are effective tools for value addition, entrepreneurs in India face unusual and high degree of risk in the initial phase of 5 to 8 years, depending on the criticality of products and their applications.

7.2 Since investment to the extent of Rs.10,000 - Rs.15,000 crore would be required, the committee decided after extensive deliberations that for attracting investment, it is necessary to provide policy and fiscal support to the technical textile industry and accordingly recommends as follows:

Fiscal & financial support

7.2.1 The Committee views that fiscal duty aspect of the different items of technical textiles including its raw materials has a significant bearing on the growth and development of the technical textiles in the country. The Committee deliberated in detail on this issue in its various meetings and decided to recommend fiscal duty restructuring on the specified items of technical textiles including its raw material and machinery.

Inclusion of additional machinery for concessional rate of duty :

7.2.2 At present 31 items of machinery for technical textiles are covered under list 46 with concessional Basic Customs Duty (BCD) of 5 percent. **The Committee recommends that additional 22 items of machinery as per list given below may also be included in the list 46**. There is a possibility that some

of the technical textile machinery items may have indigenous angle, but the committee is of the view that for promotion of the technical textile industry, it is necessary to cover such machinery items in the list of concessional BCD of 5 percent.

Table – 7.1

Technical Textile Machinery for coverage under Concessional BCD of 5 percent

1. Air Texturising Machine for yarn above 200 dtex.	2. Raschel Knitting Machine
3. Heavy Duty 2 for 1 twister	4. 3 D weaving machine
5. Dref spinning machine	6. Braiding machine for structural application
7. Warping machine for warp knitting	8. Wide width (5.0 m)direct warping machine
9. Tufting machines	10. Coating and laminating machine
11. Wide width sectional warping (5.0m)machine	12. Mechanical foamers
13. Sizing machine	14. Ink jet printing
15. Yarn coating	16. Crushing calendar
17. Yarn splitting machine	18. Extrusion (Zimmer)/ Slit/Dry coating
19. Block weaving machine	20. Special calendar
21. Weft inserted Warp knitting (WIWK) machine	22. Multiaxial knitting & weaving machine

7.2.3 The parts for the manufacture of the above machinery and spare parts for the maintenance of such machinery may also be covered under concessional duty. The Committee has also observed that in respect of 31 machinery items which are already covered under concessional BCD of 5 percent, though parts for manufacture of the aforesaid machinery are covered under the list, spare parts for maintenance of such machinery are not covered. **The Committee, therefore, recommends that spare parts for maintenance for 31 machinery items may also be covered under the list for concessional duty**.

Customs duty on high performance fibres/yarns:

7.2.4 There are number of fibres / yarns which are not manufactured in India but are required by the industry for production of different type of technical textiles. A list of 35 items identified by the industry are at **Appendix-7A**. **The BCD on these 35 items may be reduced to 5 percent or Rs.15 per kg. on whichever is higher basis**. The specialized fibres / yarns are 3-4 times costlier than the normal

yarn. The specific duty will guard against the mis-declaration of normal yarn as specialized yarn.

Anomaly in customs duty on finished goods vis-à-vis raw materials

7.2.5 Committee is of the view that Government stated policy is that customs duty on raw material should be at par or lower than on the finished goods. However, in the case of ballistic grade aramide yarn, duty is higher vis-à-vis ballistic grade aramide fabric. This is clearly an anomaly and needs to be corrected. As per exemption notification relating to defense and internal security forces i.e., General Exemption No.8, S.No.16 "ballistic grade aramide fabric, aramide thread, ballistic grade ceramic plate high performance polyethylene plate, special grade polyurethane paste and special grade thermoplastic film required for the manufacture of bullet proof jacket for supply to the armed forces of the Union under the Ministry of Defense or Police forces of the State or the Union Territories" are exempt from import duty.

7.2.6 The committee recommends that Exemption Notification may be amended as follows: "ballistic grade aramide **yarn**, ballistic grade aramide fabric, aramide thread, ballistic grade ceramic plate high performance polyethylene plate, special grade polyurethane paste and special grade thermoplastic film required for the manufacture of bullet proof jacket for supply to the armed forces of the Union under the Ministry of Defense or Police forces of the State or the Union Territories". This amendment would remove the anomaly in duty structure of aramide yarn vis-à-vis aramide fabrics.

Neutralise the impact of the high rate of mandatory duty on synthetic fibre / filament yarn on technical textiles

7.2.7 The changes in Budget for Financial Year 2004-05 would have very adverse effect in realizing the potential for development of Technical Textiles.

7.2.8 Technical Textiles use primarily synthetic fibres and filaments. The Budget for year 2004-05 has retained the excise duty on synthetic fibres and filaments at 16 percent. All textile products of Chapters 52 to 63 using synthetic fibres and/or filaments have option to clear their output at zero duty without availing cenvat credit or at 8 percent if availing cenvat credit on inputs and plant & machinery. Technical textiles are generally inputs of other industries that need to set off cenvat credit on their own input at time of removal of their outputs. In such a situation, the manufacturer of technical textiles has to necessarily choose to remain in the excise net and set off his cenvat credit at time of removal of his outputs. However

due to higher rate of duty of 16 percent on inputs as against 8 percent outputs, there is very large amount of unutilized cenvat credit from inputs. The unutilized cenvat credit becomes an additional cost to the manufacturer of technical textiles and he has no option but to recover same by an increase in his basic selling price. This becomes an additional cost to this customer and all customers in the chain needing to avail cenvat credit of their own inputs. The Budget changes have resulted in a cost escalation to most technical textile manufacturers and their customers. Local technical textiles and their products also become costlier than imports to the extent of unutilized cenvat credit.

7.2.9 As cenvat credit on inputs are not being set off, the cenvat credit on new plant and machinery shall be additional unutilized credit. If the manufacturer of technical textiles seeks to recover this unutilized credit by corresponding increase in basic price, this will further escalate his and his customers' problems. If not recovered, it will mean an increase in cost of new plant & machinery by around 16 percent. Both situation are unacceptable. **The committee therefore recommends that Government may reduce the excise duty on man-made fibres and filaments both to 8 percent or atleast 8 percent for fibres and filament yarns except PFY and 16 percent on PFY**.

Withdrawal of cenvat exemption on sanitary napkins / baby diapers / incontinence diapers

7.2.10 Under existing excise tariff sanitary napkins are covered under chapter-56 and attract 'Nil' rate of duty. Other items like baby diapers and incontinence diapers are not covered specifically but perhaps taken as covered under tariff heading pertaining to sanitary napkins and as such exempt from cenvat. The cenvat exemption encourage imports as the CVD is exempted. **The committee therefore recommends that duty exemption on sanitary napkins may be withdrawn and manufactureres may be given the option of 'zero' duty without cenvat facility or 8 percent duty with cenvat facility on lines of facility provided to other textile manufacturers. This provision will result in levying of CVD at 8 percent and may restrain imports**.

Duty free raw materials for World Bank assisted projects:

7.2.11 The technical textile products supplied to World Bank assisted projects have been provided with the facility of exemption from CENVAT and customs duty. However, raw materials for production of such items attract normal rate of

duty. Thus, indigenous manufacturers of finished goods are at disadvantageous position vis-à-vis imported products.

7.2.12 The committee examined this issue and to provide level playing field to **the indigenous manufacturers recommend that a scheme of advance licence may be introduced for the indigenous manufacturers**. **Under the scheme, indigenous manufacturers to the World Bank assisted projects may be provided with facility of import of raw materials on duty free basis**. The standard input and output norms for technical textile items may be worked out to prevent misutilisation of the scheme.

Modification in Technology Upgradation Fund Scheme (TUFS)

7.2.13 The committee noted that technical textiles are covered under TUFS; however, during the last five years of its operation (i.e. 1.4.1999 to 30.4.2004) only 16 applications with total project cost of Rs.86.33 crore and loan requirement of Rs.40.94 crore have been received under TUFS. Out of these, 14 applications with a total project cost of Rs.64.31 crore have been sanctioned and loans have been disbursed in respect of 12 applications with total project cost of Rs.54.24 crore and the amount disbursed has been only Rs.20 crore.

7.2.14 **To attract investment under TUFS, the committee recommends that interest incentive on technical textiles project under TUFS may be increased from 5 to 8 percent**. Since the TUFS tenure is only upto 31.03.2007, the committee recommends that to encourage investment in nascent industry like technical textiles the interest subsidy may continue upto 31.03.2010.

Standards for technical textiles.

7.3.1 Unlike conventional textiles, the products of technical textiles are governed by much stricter tolerance of parameters and have little value or alternative use if they do not confirm to the rigid specifications. **The government / BIS may therefore set appropriate standards to facilitate adherence to stringent functional requirements and parameters**. These standards should be in line with the international standards to encourage production of international quality technical textile items in the country. The Nodal agency/ Centres of Excellence may be entrusted with the responsibility for initiating this exercise.

7.3.2 The committee was informed that viscose is the preferred fibre for use in medical textiles abroad and British, US and Japanese Pharmacopoeia have included viscose as a base for medical textile items. However, Indian

pharmacopoeia, only includes cotton as a base material. During its inter-active session with Ministry of Health and Family Welfare, the committee was informed that standards for most of the medical textile items are provided in the BIS standards, which are in line with international standards. The committee recommends inclusion of viscose in the Indian pharmacopoeia. It may be added in this context that, India has a very strong base of viscose fibre in the country like cotton and possibility of synergistic growth of viscose based medical textile items is very strong in the country. The committee recommends that IMC should take up this issue of expansion of Indian Pharmacopoeia to cover viscose with Ministry of Health and Family Welfare.

Regulatory Framework

7.4 For development and promotion of certain technical textile products regulatory frame work is strategically important. Accordingly, the committee has recommended regulatory framework for some items. **However, the provision for making it mandatory may be given prospective effect (i.e., two years henceforth) to enable the indigenous manufacturers to cope up with the demand**. The items for which regulatory framework is suggested are as follows:

Geotextiles & Geogrids

7.4.1 In India the poor road conditions and high maintenance cost require serious attention and the solution lies in the use of geotextiles. Analysis of global best practices for the usage of geotextile reveals that on account of the intrinsic benefits, their application in the road and other infrastructure projects has been extensive in developed countries like USA, Europe, Japan, etc.

7.4.2 During recent past in India also there is a focused approach for infrastructural development across the country, particularly in the area of roads, rail roads, etc. The infrastructure can be developed as per international standards by using geosynthetics for separation, filtration and drainage, reinforcement and erosion control to improve the performance and life of the infrastructure.

7.4.3 The committee noted that regulations in the developed countries do not mandate the usage of geotextiles but it is mostly based on the benefits derived like, increase in road life to 3 - 4 times of the existing roads, minimising road maintenance and improving riding quality without potholes and reflective cracking.

7.4.4 China has been undertaking mass infrastructure constructions and is estimated to become the largest market of geosynthetics in the current decade (2001-2010). In recent years China has invested $86.7 billion in improving its road- railway network, new airports, water conservancy projects, etc. The committee noted that after the disastrous flooding of Yangste River in 1998, Prime Minister, Zhu Rong Yi issued a document in which he encouraged Engineers to use geosynthetic products in their work. This shows the level of involvement in increasing the usage of geosynthetics in China. In 2001-02 China alone consumed 250 mn sq. mtrs of geosynthetics

7.4.5 Indian investment in infrastructure projects is anticipated at around Rs. 2,19,661 crore ($ 40 bn) during the period 2001-02 to 2007-08 but the usage of geosynthetics (geotextiles & geogrids) has not been significant when compared to the initiatives taken by countries like China, Korea, etc.

7.4.6 The usage of geotextiles is low in India due to traditional geo-technical and civil engineering practices and resistance to adopt geotextiles over conventional methods. **Therefore, the committee recommends that use of geosynthetics for construction of road where subsoil CBC is less than 3 and asphalt pavement overlay may be made mandatory**. For this purpose, type and composition of geosynthetics to be used in different soil conditions should be specified.

Use of Fire retardant textiles

7.4.7 The public places like theatres, public halls, temporary shamiyanas and public places including hotels, trains, etc, should use textiles which are fire retardant, providing protection and avoiding catastrophe of human losses as experienced by the country in the past.

7.4.8 The National Building Code (NBC) stipulates compliance with minimum standards for fire safety necessary in public interest. This is applicable to buildings (part of buildings) where the number of persons are more than 50, congregate for amusement, recreation social activities etc. like theatres, halls, auditoriums, restaurants, hospitals, air terminals, rail, air and marine transportation services, etc.

7.4.9 **The committee recommends that the use of FR textiles should be made mandatory in all public places where the public has access irrespective of the number of persons as stipulated in NBC**.

Seat Belts

7.4.10 Under the Motor Vehicle Act (MVA) all passenger cars are to be fitted with four seat belts for front and rear passengers.

7.4.11 Seat belt producers follow the AIS 205/2000 safety seat assemblies-specifications developed by Automotive Research Association of India (ARAI).

7.4.12 As per the Supreme Court notification, all State Governments are expected to ensure that the driver and co-driver use seat belts. However, this is not being strictly adhered to. **There is a need to enforce the law of mandatory use of seat belts in four wheeler vehicles in all states**.

7.4.13 **Likewise, the uses of helmets should be made mandatory in all states. MVA should also make installation of airbags in all new cars mandatory**.

Environmental Protection

7.4.14 There is a need to preserve the environment and natural resources such as water, soil, etc. There is also a need to prevent pollution of environment by various activities, particularly industrial production and waste management. **Government directives may be issued for use of textiles in the land fill projects**.

Other promotional support

7.5.1 The Government should encourage formation of technical textile association and extend fund support on matching basis for the following purposes:

- creating awareness about the technical textile products to improve the market potential of technical textile items,
- Strive for technical tie-ups with German/USA/Japanese companies and also buy back arrangements for its members.

7.5.2 There is a bias in favour of imported geotextiles. Most of the geotextiles currently used in the country are for World Bank assisted projects and use imported geotextiles. The committed noted that in most of the tender documents country specific trade names are being mentioned which goes against the indigenous manufacturers. **To provide level playing field, the committee recommends that the tender documents of the concerned Ministries / Departments should specify only the performance parameters and anybody meeting those parameters should be eligible to apply against those tenders**.

7.5.3 There is a good scope for export of health care disposable items and geotextiles to the European countries. However, for such exports CE certification is mandatory. However, obtaining of CE certification is quite expensive. **Therefore, the committee recommends that the government may work out a scheme to reimburse 50 percent of the expenditure incurred by the exporters in obtaining this certificate for five years**.

7.5.4 **For meeting the requirement of trained professionals by the technical textile industries, technical textiles should find place in the curriculum of at least some of the textile academic institutions**. IMC should ensure after interaction with Ministry of Human Resources that technical textiles are included in the existing curriculum of different branches of engineering and science. For example, Civil Engineers should know about geo synthetics; automobile engineers should know about automotive textiles; medical technicians and researchers should know about medical textiles etc. etc.

7.5.5 Some of the items of the technical textile industry with huge market potential are reserved for production for SSI sector, i.e., baby diapers, sanitary napkins and incontinence diapers. However, the core machinery for manufacture of these items is beyond the SSI limit. Therefore, there is reported to be large scale under invoicing to bring the same under SSI limit. This also prevents setting up of units with MES and also encourages MNCs to import such items and sell them at exorbitant price after repacking. **The committee therefore suggests that SSI reservation for baby diapers, sanitary napkins and incontinence diapers should be removed to encourage setting up of large scale high-tech units**.

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CHAPTER - 8

RESEARCH AND DEVELOPMENT NETWORK

Research and development in the different application areas of technical textiles is an essential prerequisite for manufacture of technical textiles in the country. There are number of R&D agencies, technical institutes and research labs of private textile units which are engaged in R&D activities relating to technical textiles. However, there is no networking or coordination of R&D activities of these agencies. Therefore possibility of duplication of R&D activities in such scenario cannot be over ruled. Thus the need for networking of R&D agencies for coordinating their activities.

8.2 The Committee has identified some of the major R&D agencies involved in research activities connected to technical textiles. Those agencies are given below:

1. The Synthetic & Art Silk Mills' Research Association (SASMIRA), Mumbai (Nodal Agency).
2. Defence Materials & Stores Research & Development Establishment, Kanpur.
3. Aerial Delivery Research & Development Establishment, Agra Cantt.
4. Aeronautical Development Agency, Bangalore.
5. Composite Product Development Centre (COMPROC), Defence Research & Development Laboratory, Hyderabad.
6. Ahmedabad Textile Industry's Research Association (ATIRA), Ahmedabad.
7. Bombay Textile Research Association (BTRA), Mumbai.
8. The South India Textile Research Association (SITRA), Coimbatore.
9. Northern India Textile Research Association (NITRA), Ghaziabad.
10. Indian Jute Industries Research Association (IJIRA), Kolkata.
11. Wool Research Association (WRA), Thane, Maharashtra.
12. Man-Made Textiles Research Association (MANTRA), Surat.
13. National Institute for Research in Jute & Allied Fibre Technology (NIRJAFT), Kolkata.
14. Institute of Jute Technology, Kolkata.
15. Indian Institute of Technology, Delhi.
16. Indian Institute of Technology, Bombay.
17. Central Road Research Institute, New Delhi.
18. Central Building Research Institute, Roorkee.
19. P.S.G.College of Engineering & Technology, Coimbatore.

20. Central Coir Research Institute, Coir Board, Kalavoor, Kerala.
21. Research, Designs & Standards Organisation (RDSO), Ministry of Railways, Lucknow.
22. Controllerate of Quality Assurance Textiles & Clothing (CQAT&C), Kanpur.
23. Automotive Research Association of India, Pune.

8.3 There might be some more R& D institutes. IMC may list out all such institutes including the Research Labs of private industries.

8.4 **The Inter-Ministerial Committee should coordinate the activities of all such agencies to prevent duplication of available work and also take advantage of work done some where else. Further, the Committee would ensure that public funding to research agencies is utilized for industry oriented research and not for fundamental research**.

8.5 Further, there are many international agencies which are engaged in the advance level research in diverse application areas of technical textiles. There is need to promote professional linkage between reputed national and international institutes. The Inter-Ministerial Coordination Committee would also encourage professional linkage between national and international institutes.

8.6 The funding pattern for research agencies would be on the UK model of faraday partnership as detailed out in para 6.13.

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CHAPTER – 9

FIVE YEARS ACTION PLAN FOR PROMOTION OF TECHNICAL TEXTILES

The committee noted that there is a huge market potential for technical textiles in the country. The market size of technical textiles is expected to grow from about Rs.19,130 crore in 2003-04 to Rs.29,579 crore by 2007-08. The committee is of the view that consumption of technical textiles is bound to increase on account of their specific physical and functional properties. In the absence of indigenous availability, the imports of technical textiles will take place resulting in large scale foreign exchange outgo and loss of investment opportunities to the extent of Rs.10,000 – Rs.15,000 crore and resultant job opportunities. **Therefore, committee is of strong view that government should take immediate action to create conducive environment for promotion of technical textiles in the country**.

Identified potential products / product groups:

9.2 Technical textiles represents a multi-disciplinary field with numerous end use applications. Depending on the product characteristics, functional requirements and end-use applications, the technical textile products have been broadly grouped into 12 sectors. Each of the 12 group cover number of products and in all there will be hundreds of products. The committee decided to shortlist potential products based on the industry's capability, infra structure, market potential for initial prioritisation for development instead of thinly spreading resources on creating support infrastructure for a large number of products. The 25 products / product groups shortlisted by the committee are as given below:

Identified potential 25 products/product groups

• Geotextiles	• Sports footwear	• balloon fabric and parachute fabric
• Webbing for seat belts	• Non-woven glass mat for battery separator	• fire retardant fabrics
• sanitary napkins	• Velcro	• ballistic protective clothing
• incontinence diapers/ baby diapers	• Computer ribbon	• Surgical dressings
• health care disposables (caps,masks,gowns, etc)	• Air bags	• Food grade jute bags
• soft luggage material	• fibre fill	• Spunbond nonwoven
• Polyolefin (HDPE / PP) woven sacks	• Stuffed toys	• Tafetta cloth
• Hoardings and sinages	• Filters	
• shade fabrics	• zip fasterners	

(vide paras 5.5 to 5.29)

9.3 Since the information base of technical textiles is limited, the committee thought it prudent to get some of the project profiles made to facilitate entrepreneurial activity in the technical textile projects. The committee got 18 project profiles made; 10 by TECS, one by M/s. Kusumgar Corporates and 7 by SASMIRA. The details of project profiles are at appendices 5A, 5B and 5C. The names of the projects are as given below:

Projects of which profiles are made

• Needle punch project	• Spunbond project	• Industrial filter fabric
• Geogrid project	• Spun lace project	• Woven geotextiles
• Seat belt webbing project	• Compression garment	• Safety and protective textiles
• Tafetta fabric	• Agro shade net project	• Shoe uppers
• Coated fabric	• Fibre fill project	• Double needle bar spacer project
• Conversion activity of: - *Sanitary napkins* - *Incontinence diapers* - *Baby diapers*	• Conversion activity of health care disposables	• Surgical dressing

9.4 The committee suggests that the government may make public the project profiles as soon as the report of the committee is submitted to enable the entrepreneurs to make the investment decisions. **However, committee emphasis that project profiles have been made based on certain assumptions and investors need to do detailed research on the project considering their own strength and capabilities before deciding on investing in the particular project**.

(vide paras 5.30 to 5.33)

Institutional mechanism:

9.5 The committee is of the opinion that to encourage and sustain the growth of the technical textile industry, a strong network of institutional mechanism needs to be created by the government.

Inter Ministerial Committee (IMC)

9.6 Since, the market segment of the technical textiles is broad based and its usage is already in diverse industries and is developing in other industries also, the committee has recommended in its interim report constitution of an IMC to coordinate the activities of the different ministeries. The government has already set up an IMC comprising of representatives of different TRAs and user

ministries. The IMC should coordinate the implementation of Action Plan recommended by ECTT and take necessary follow-up action.

(vide paras 6.2 to 6.4)

Centres of Excellence

9.7 The committee also recommends setting up of centres of excellence on the line of such centres established in UK by entrusting each centre a separate product / product groups to provide infra structure support at one place for the convenience of the manufacturers of technical textiles. The essential facilities to be created in the Centres of Excellence could be as follows:

(vide paras 6.5 to 6.7)

- ***Facilities for testing and evaluation of technical textiles for which it is developed as a Centres of Excellence :*** state-of- the-art common testing facilities should be created in Centres of Excellence for their respective product / product groups. The testing facility should cater to the requirements of testing the final products as well as fibre , yarn and other inputs that go into the final product.

  (vide paras 6.7.1 to 6.7.4)

- ***National and international accreditation:*** The testing facilities of Centres of Excellence should get the national and international accreditation . The accreditation for awarding CE certificate should also be taken up by the respective Centres of Excellence.

  (vide paras 6.7.5 to 6.7.7)

- ***Development of Resource Centre with I.T. infrastructure :*** The information resource centre should be set up, equipped with technical literature, reference material, books, a sample bank containing sample of various products and information about manufacturing production, standards, testing procedures etc. Centres of excellence may in fact serve as a 'knowledge and reference base' for technical textile entrepreneurs.

  (vide paras 6.7.8 to 6.7.11)

- ***Facilities for indigenous development of prototypes :*** To provide back up support to the industry, complex products of technical textiles in emerging areas need to be developed on a pilot scale and the technology should be transferred to the industry after standardization and optimisation of the production process.

  (vide paras 6.7.12 to 6.7.13)

- ***Facilities for training of core personnel :*** The Centres of Excellence should take up the responsibility of training of core personnel of the respective segment. The training to the core personnel should be provided by inviting consultants from abroad.

(vide paras 6.7.14 to 6.7.15)

- ***Facilities for regular training of personnel from the industry*** : The Centres of Excellence should set up the facilities for regular training of the technicians and may also explore the possibility of creating satellite training facility in clusters of the technical textiles coming under their jurisdiction.

(vide para 6.7.16)

- ***Creating awareness:*** The Centres of Excellence should be made responsible for creating awareness among the potential investors about the product coming under their purview.

(vide para 6.7.17)

Designation of centres of excellence

9.8 A professional agency like BTTG may be appointed by the Govt. to carry out the detailed study for designating the centres of excellence for a particular product / product group / segment. The professional agency may also suggest the required testing equipments, accreditation required and the human resources requirement and other infrastructure facilities required for each centres of excellence.

(vide para 6.8)

Steering Committee for growth & development of technical textiles (SCDGTT)

9.9 A steering committee for growth & development of technical textiles (SCGDTT) may be set up under the Chairmanship of Textile Commissioner to monitor and review the growth of the technical textile industry and also activities of centres of excellence. The SCGDTT should comprise directors of all centres of excellence and should co-opt 10 experts drawn from manfucaturers, acedamics and users of technical textiles

9.10 In order to provide direction for scientific research a sub-committee of SCGDTT under the Chairmanship of Textile Commissioner may be set up with

Director, SASMIRA as a Member Secretary. The sub-committee would work as a 'technical think tank' and would comprise of technical experts drawn from IITs, other institutes and also research agencies of private sectors.

(vide paras 6.9 to 6.12)

Funding pattern

9.11 Initially 100 percent funding could be provided by the government for setting up centres of excellence. However, for the developmental work or R&D, the UK model for Faraday partnership should be adopted which provides for 50 percent funding by government and 50 percent by the concerned industry segment.

(vide para 6.13)

Policy support

Fiscal & financial support

9.12 Specified 22 machinery which are critically needed by the technical textile industry should be covered under the list of concessional 5 percent custom duty.

(vide para 7.2.2 & 7.2.3)

9.13 Specified high performance fibres and yarns should be allowed to be imported at notional import duty of 5 percent or Rs.15 per kg. whichever is higher to improve availability of raw material for the production of technical textiles at reasonable price.

(vide para 7.2.4)

9.14 Anomaly in custom duty on ballistic grade aramide fabric vis-à-vis ballistic grade aramide yarn should be removed by amending the exemption notification relating to defence and internal security forces i.e, General Exemption No.8, S.no.16.

(vide paras 7.2.5 to 7.2.6)

9.15 To neutralize the impact of the mandatory duty on synthetic fibre / yarn on technical textiles the excise duty on man-made fibre and filaments should be reduced to 8 percent or at least 8 percent on all fibres and filaments except polyester filament yarn and 16 percent on polyester filament yarn.

(vide paras 7.27 to 7.2.9)

9.16 Excise duty exemption may be withdrawn on sanitary napkins / baby diapers / incontinence diapers and manufacturers may be given the option of 'zero' duty without cenvat facility or 8 percent duty with cenvat facility on lines of duty structure of other textile manufacturers. The cenvat exemption encourage imports as the CVD is exempted. The withdrawal of cenvat exemption will result in levying of CVD at 8 percent and may restrain imports.

(vide para 7.2.10)

9.17 To provide level playing field to the indigenous manufacturers supplying to world bank assisted projects, a scheme of advance license may be introduced. Under the scheme, facility of import of raw materials on duty free basis on the basis of standard input/output norms should be provided.

(vide paras 7.2.11 & 7.2.12)

Modification in TUFS

9.18 To encourage investment in technical textiles, the interest incentive on technical textile projects under TUFS, may be increased from 5 percent to 8 percent and the interest subsidy may continue for projects sanctioned upto 31.3.2010

(vide paras 7.2.13 & 7.2.14)

Standards for technical textiles.

9.19 The government / BIS should set up standards in line with international standards for different items of technical textiles to facilitate adherence to stringent functional requirements and parameters.

(vide paras 7.3.1 & 7.3.1)

Regulatory framework

9.20 For development and promotion of certain technical textile products regulatory framework is strategically important. Therefore, committee has recommended statutory framework for some items. However, provision for making it mandatory may be given prospective effect, say after 24 months to enable the indigenous manufacturers to cope up with the demand. The items recommended for mandatory use are as follows:

- ***Geotextiles:*** The use of geosynthetics for construction of road where subsoil CBC is less than 3 and asphalt pavement overlay may be made mandatory.

(vide paras 7.4.1 to 7.4.6)

- ***Use of fire retardant textiles:*** The use of fire retardant textiles should be made mandatory in all public places where the public has access irrespective of the number of persons as stipulated in the National Building Code (NBC).

(vide paras 7.4.7 to 7.4.9)

- ***Seatbelts, Helmets and Airbags:*** The law of mandatory use of seatbelts in four wheeler vehicles in all states should be strictly enforced. The use of helmets should be made mandatory in all states and installation of airbags should be made mandatory in all new cars.

(vide paras 7.4.10 to 7.4.13)

- ***Environmental protection:*** Directives may be issued for the use of textiles in the land fill projects.

(vide para 7.4.14)

<u>Other promotional support:</u>

9.21 Government should encourage formation of technical textile association and extend fund support on matching basis for specified purposes.

9.22 To provide level playing to the indigenous manufacturers, tender documents of the ministeries /departments should specify only the performance parameters instead of country specific trade names and anybody meeting those parameters should be eligible to apply against those tenders.

9.23 The government may work out a scheme to reimburse the 50 percent expenditure incurred during the first five years for obtaining CE certificate.

9.24 For meeting the requirement for trained professionals by the technical textile industries, technical textile should find place in the curriculum of at least some of the textile academic institutions.

9.25 To encourage setting up of large scale high-tech units, government may de-reserve baby diapers, sanitary napkins and incontinence diapers.

(vide paras 7.5.1 to 7.5.5)

<u>Research & Development network</u>

9.26 Research & Development in the different areas of technical textiles is an essential pre-requisite for manufacture of technical textiles in the country. There

are number of R & D agencies which are engaged in R & D activities relating to technical textiles. There is a need for networking of R&D agencies for coordinating their activities. The IMC should coordinate the activities for all such activities to prevent duplication of R&D work and also to ensure that public funding to these agencies is focused for industry oriented research. IMC should also encourage professional linkage between national and international institutes engaged in research in diverse application areas of technical textiles.

(vide paras 8.1 to 8.6)

9.27 The committee has made limited and focused recommendations which are essential for promoting the growth of this industry in the country. The government may initiate action immediately to implement the suggestion of the ECTT to provide the necessary impetus to the growth of technical textile industry in the country.

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EXPERT COMMITTEE ON TECHNICAL TEXTILES
(RESOLUTION NO.24/1/2001-A&MMT-MOT, NEW DELHI, DATED 4TH JULY, 2002 AS AMENDED ON 20TH MARCH, 2003 & 24TH JULY, 2003)

B. D. JETHRA
MEMBER

R. C. JHAMTANI
MEMBER

A. N. JARIWALA
MEMBER

M. K. BARDHAN
MEMBER

MOHAN KAVRIE
MEMBER

V. S. CHALKE
MEMBER

RANGANATHAN SRINIVASAN
MEMBER

Y. K. KUSUMGAR
MEMBER

SANJAY KAJARIA
MEMBER

SUBODH KUMAR
CHAIRMAN

Mumbai, 27th July, 2004.

Appendices

Appendix - I

No.24 / 1 / 2001-A&MMT
Government of India
Ministry of Textiles
*****

New Delhi, Udyog Bhawan
4th July, 2002.

OFFICE MEMORANDUM

Subject : **Setting up of Expert Committee for growth and development of Technical Textiles**.

The undersigned is directed to say that the Expert Committee on Textile Policy has, in its report of August 1999 made significant observations for giving increasing attention to technical textiles. However, it is felt that the Expert Committee's observations are not adequate to support further action in respect of technical textiles.

2. In realization of this position and in appreciation of the emerging economic thrust of technical textiles, the Government has decided to set up another Expert Committee exclusively for growth and development of technical textiles.

3. The terms of reference of the Expert Committee will be as follows :

i) Collect all major information relevant to commercial exploitation of the potential of technical textiles and present them with reference to the Indian context.

ii) Review the present position of the world market for technical textiles and chart its growth.

iii) Evaluate the raw material situation in the country and, with reference to considerations of availability and competitiveness, prioritise for exploitation of different fibres.

iv) Review the present status of technical textiles in the country with special reference to the type and quality of products produced.

v) With reference to emerging technologies assess the adequacy of arrangements for promoting availability of machinery.

vi) Identify the technical, financial, fiscal, marketing, and human resource developments steps required to motivate organized production and processing of technical textiles.

vii) Recommend an appropriate administrative structure for giving coordinated attention to development of fibres and products.

viii) In this backdrop, and with reference to the stated objectives, prepare a five-year action plans so as to optimize exploitation of the opportunities available nationally and internationally.

4. The composition of the Committee will be as follows :

i)	Shri S. Sathyam, Retired Secretary to the Govt. of India	--	Chairman
ii)	Adviser, Planning Commission, Yojana Bhawan, New Delhi.	--	Member
iii)	Shri A.N.Jariwala, Chairman, Federation of Indian Art Silk Weaving Industry, 3rd Floor, SASMIRA, SASMIRA Marg, Worli, Mumbai – 400 025.	--	Member
iv)	Shri M.K.Bardhan, Director Synthetic & Art Silk Mills Research Association, SASMIRA Marg, Worli, Mumbai – 400 025.	--	Member
v)	Shri J.K.Jhaver, President, Southern Group of Industries, Chennai.	--	Member
vi)	Shri V.S.Chalke, Chairman Synthetic & Art Silk Mills Association Ltd., 3rd Floor, SASMIRA, SASMIRA Marg, Worli, Mumbai – 400 025.	--	Member
vii)	Mr. Ranganathan Srinivasan, 1/132 A, Laxmi Bhavan, Opp. BIT Cottages, Matunga, Mumbai – 400 019.	--	Member
viii)	Dr. A.K.Sen, Retd. Senior Scientist (DMSRDC) 117/631, Pandunagar, Kanpur – 208 005.	--	Member
ix)	Shri Sanjay Kajaria Indian Jute Mills Association, Kolkata.	--	Member
x)	The Textile Commissioner Office of the Textile Commissioner New Marine Lines, CGO Complex, Mumbai – 400 020.	--	Member Secretary

5. The Committee will submit its report before 31st December, 2002.

6. The Committee will have the discretion to devise its own procedures. It will make field visits as may be considered necessary Secretarial assistance to it will be provided by the Office of the Textile Commissioner.

7. The Chairman will have the discretion to undertake tours singly on behalf of the Committee where considered necessary by him so to do. Tours of other members of the Committee will have to be authorized by the Chairman. The Chairman of Members authorized by him will seek prior and specific permission of the Ministry in case of foreign tours.

8. The Committee can hold its meetings at any place of the choice; but as far as possible, it will meet either in the Office of the Textile Commissioner or in the Ministry of Textiles.

9. The entitlements of the Chairman to facilities for travel, transporation, accommodation etc. will be at par with the facilitites admissible to a Secretary to the Government of India.

10. The funds will be released to SASMIRA, which in turn shall make necessary payments for the activities of the Committee on the recommendations / verification of the expenditure by the Textile Commissioner.

This issues with the approval of Minister of Textiles.

Sd/-
(Vivek Joshi)
Deputy Secretary to the Govt. of India

To:

All the Members of the Expert Committee

Copy forwarded to :

(i) PS to MOT.
(ii) PS to MOS (T).
(iii) PPS to Secy (T).

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Appendix - II

The reconstituted composition of the Committee

i)	Shri Subodh Kumar Textile Commissioner.	--	Chairman
ii)	Adviser, Planning Commission, Yojana Bhawan, New Delhi.	--	Member
iii)	Shri A.N.Jariwala, Chairman, Federation of Indian Art Silk Weaving Industry, 3rd Floor, SASMIRA, SASMIRA Marg, Worli, Mumbai – 400 025.	--	Member
iv)	Shri M.K.Bardhan, Director Synthetic & Art Silk Mills Research Association, SASMIRA Marg, Worli, Mumbai – 400 025.	--	Member
v)	Shri Mohan Kavrie, Managing Director, Supreme Nonwovens (P) Ltd., Central Point, 7th Floor, 18th Road, Chembur, Mumbai. .	--	Member
vi)	Shri V.S.Chalke, Chairman Synthetic & Art Silk Mills Association Ltd., 3rd Floor, SASMIRA, SASMIRA Marg, Worli, Mumbai – 400 025.	--	Member
vii)	Mr. Ranganathan Srinivasan, 1/132 A, Laxmi Bhavan, Opp. BIT Cottages, Matunga, Mumbai – 400 019.	--	Member
viii)	Shri Y.K.Kusumgar, President, Kusumger Corporates, 14/15, Aradhana Apartment, Besant Road, Vile Parle (W), Mumbai.	--	Member
x)	Shri Sanjay Kajaria Indian Jute Mills Association, Kolkata.	--	Member
x)	Shri B. D. Jethra Retired Adviser, Planning Commission, A705 Karam Hi Dharam Apartments Sector 55, Gurgaon-122003.	--	Member

*****

PROPERTIES OF SELECTED HIGH PERFORMANCE FIBERS

Fiber Properties	*Aramid* M=meta P=para	PAN/ Carbon	Glass	PBI	Novaloid (Phenolic)	PPS	Poly Acrylate	PTFE	Poly imide	Poly Amide Imide
Tenacity - dry g/d	M 4.0-5.3 P 2 1 -27	24	15.3	2.6-3.0	1.3-2.4	3.5	1.3-1. 7	0.9-2.0	3.7	3.4
Tensile - 000 psi	M 90 P 400	31	500	50	20-30	61	25-33	40-50	67	N/A
Elongation at break %	M 22-32 P 2.5-4.0	19	4.8	25-30	30-6	40	20-30	19-140	19-21	15-20
Moisture Regain (%)	M 6.5 P 4.0	9	<0.10	15	6-7.3	0.6	12	0	3.0	3.4
Specific Gravity	M 1.38 P 1.44	1.40	2.50	1.43	1.27	1.37	1.50	2.10	1.41	1.34
A vg. Toughness - g/d	M 0.30 P 0.85	N/A	0.37	0.40	N/A	N/A	N/A	0.15	N/A	N/A
Abrasion Resistance	M Good P Poor	Poor	Poor	Good	Poor	Good	Fair	Good	Good	Good
Resilience	Excellent	Poor	Poor	Excel	Fair	Good	Good	Poor	Fair	N/A
Chemical Resistance										
Solvents	M Excel P Good	Good	Excel	Excel	Excel	Excel	Good	Excel	Excel	Excel
Acids: Dilute: Concentrated	Good Fair	Good Poor	Excel Excel	Excel Excel	Excel Poor	Excel Good	Excel Excel	Excel Excel	Excel Excel	Good Fair
Alkalis:Dilute: Concentrated	Good Good	Good Good	Fair Fair	Excel Good	Excel Excel	Excel Excel	Excel Excel	Excel Excel	Poor Poor	Good Good

Fiber Properties	***Aramid*** **M=meta P=para**	**PAN/ Carbon**	**Glass**	**PBI**	**Novaloid (Phenolic)**	**PPS**	**Poly Acrylate**	**PTFE**	**Poly imide**	**Poly Amide Imide**
Ultraviolet (UY)	Poor	Good	Excel	Good	Excel	Excel	Excel	Excel	Good	Good
Thermal Properties										
Limiting Oxygen Index (LOI)	M 30 P 29	55	>100	38	33	34	43	>100	40	32
Thermal Conductivity (BTU-inlhr^2 per ^{O}F)	M 0.26 P 0.30	.03	7.20	0.26	0.28	0.30	0.31	0.20	N/A	0.08

PAN – Polyacrylonitrile
PBI – Polybenzimidazole
PPS – Polyphenylene sulphide
PTFE – Polytetra fluoroethylene

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Appendix-3B

FIBRES USED IN TECHNICAL TEXTILE PRODUCTS

Fibre	Agrotech	Build-tech	Clothtech	Geotech	Hometech	Indutech
	(1)	(2)	(3)	(4)	(5)	(6)
Cotton		Awnings, fibre-reinforced concrete	Sewing threads, shoe lining, wadding		Upholstery, wall décor, window textiles, filled textiles, kitchen textiles, bedroom textiles, quilted, blankets, bedspreads, bathroom textiles	Belts, tapes, Newars, harness, ropes, twines, cords
Jute	Nets			Geomat	Carpets and wall decor	Ropes, twines, cords
Silk						Printing screens
Viscose						Coating and paint filter
Poly ethylene terephthalate (Polyester)	Belts, shade nets	Tents, clear span structure, air structure, Air inflated ribs, awnings, home and industrial construction, inflated concrete shell	Sewing threads, battings	Geomat, geogrid, composite drain	Upholstery, wall décor, window textiles, filled textiles, kitchen textiles, bedroom textiles, quilted textiles, blankets, bedspreads, bathroom textiles	Dust filters, air filters, fuel filters

Fibre	Agrotech	Build-tech	Clothtech	Geotech	Hometech	Indutech
	(1)	(2)	(3)	(4)	(5)	(6)
PET / COTTON		Awnings	Protective clothing		Upholstery, wall décor, window textiles, filled textiles, kitchen textiles, bedroom textiles, quilted textiles, blankets, bedspreads, bathroom textiles	Engine filter
High Tenacity PET				Geogrid		
Polyamide	Belts, mushroom nets	Air inflated ribs, fibre-reinforced concrete		Geomat, composite drain	Carpets	Dry filters
Poly acrylonitrile		Awnings, canopies			Blankets, carpets	Dry filters
Polypropylene (PP)	Mulch mats, vegetable/fruit bags, sunscreen, tree wrappers	Fibre-reinforced concrete, home and industrial construction		Geomat, Geogrid, composite drain		Liquid filters, electret filter, Dry filters
Polyethylene (PE)	Protective nets, sunscreen, wind shield, packing sacks		Fusible interlinings	Geomat, geonet, geocell, composite drain, geomembranes		

Appendix-3B (Contd..)

Fibre	Agrotech	Build-tech	Clothtech	Geotech	Hometech	Indutech
	(1)	(2)	(3)	(4)	(5)	(6)
Acetate rayon					Draperies, blankets, quilted products	Cigarette filters
Poly Vinyl Chloride (PVC)		Tents, air structure, thermoplastic roofing, storage		Composite drain, geomembranes	Upholstery, fire retardant curtain	fuel filters, milk filter
Poly Vinyl Alcohol (PVA)						Liquid filters
PolyEther Ether Ketone (PEEK)						Industrial seals, papermakers felts, dryer fabrics, pressure filtration, brush bristles,
Poly Phenylene Sulphide (PPS)						Dry filters, battery separators, papermakers felt
Aramid		Stadium roofs, airport terminal, fibre-reinforced concrete				Dust filters, Dry filters conveyor belts, hoses for off-shore application, optical fibre cable, mooring ropes

Appendix-3B (Contd..)

Fibre	Agrotech	Build-tech	Clothtech	Geotech	Hometech	Indutech
	(1)	(2)	(3)	(4)	(5)	(6)
Carbon		Insulation of cables				Liquid filter, conductive fabrics
Glass	Greenhouse	Fibre-reinforced concrete, acoustic, home and industrial construction		Geogrid,		Dust filters, air filters, fuel filters, electrical circuit boards
Poly Tetra Fluoro Ethylene (PTFE)		Acoustics				Dry filters
Ceramic						Soot filters
Phenolic						Flame and smoke barrier in aircraft, submarines, industrial friction material, cables
Polybenzimidazole (PBI)						Aircraft fire blocking
Metallic					Fancy yarns	
Arimid P 84						High temperature seals and packing, filtration

Appendix-3B (Contd..)

Fibre	Agrotech	Build-tech	Clothtech	Geotech	Hometech	Indutech
	(1)	(2)	(3)	(4)	(5)	(6)
Melamine-formaldehyde						High temperature filtration, fire blocking, heat insulation
Poly Vinylidene chloride (PVDC)					Outdoor furniture,	Wet filtration
Polyphenelebenzobisoxazole (PBO)						High fidelity speaker cones, cables

FIBRES USED IN TECHNICAL TEXTILE PRODUCTS (Contd…)

Fibre	Medtech	Mobiltech	Oekeotech	Packtech	Protech	Sporttech
	(7)	(8)	(9)	(10)	(11)	(12)
Cotton	Bandages, gauzes, lints, wadding, surgical clothing, bedding, uniforms, wipes			Bags, cords, twines	Flame retardant, gloves, Electrical protection, tarpaulins	Sportswear, active wear for kids, tents
Jute			Biodegradable vegetation	Bags, twines, cords		
Wool		Seat covering, carpet				
Silk	Sutures, soft tissue implants					
Viscose	Bandages, wadding, gauzes extracorporeal devices surgical masks, wipes, incontinence diapers	Tyres				

Fibre	Medtech	Mobiltech	Oekeotech	Packtech	Protech	Sporttech
	(7)	(8)	(9)	(10)	(11)	(12)
Polyethylene terephthalate (Polyester)	Sutures, Orthopedic implants, cardiovascular implants, orthopedic bandage, extracorporeal devices, surgical masks, surgical drapes, bedding, uniforms, incontinence diapers	Seat covering, tyres, Composite for body work, carpet	Erosion control	Films and sheeting, soft luggage, slings	High temperature resistant fabrics , gloves, Electrical protection, clean room textiles, automotive covers	
PET / COTTON					Radiation protective clothing	Sportswear and active wear for kids
High Tenacity PET		Composite for body work, hoses, driving belts, air springs, seat belts				

Appendix-3B (Contd..)

Fibre	Medtech	Mobiltech	Oekeotech	Packtech	Protech	Sporttech
	(7)	(8)	(9)	(10)	(11)	(12)
Polyamide	Sutures, bandage, soft tissue implants	Seat covering, air bag, carpet		Films and sheeting	High temperature resistant fabrics, encapsulated suits, gloves, Radiation protection, thermal insulation, high visibility textiles, sleeping bags, rain coats, windbreakers	Ski and snow apparel, swim suits, diving suits
Poly Acrylonitrile		Seat covering			High temperature and flame resistant fabrics	
Poly propylene (PP)	Sutures, artificial lungs, incontinence diapers, surgical barrier clothing	Carpet		Films and sheeting, bags	High visibility textiles	Artificial turfs
Poly Ethylene (PE)	Sutures, soft tissue implants		Clay liners	Films and sheeting, bags	Mechanical protection	
Polyvinyl chloride (PVC)				Films and sheeting,	Gloves, visors, splash suits	

Appendix-3B (Contd..)

Fibre	Medtech	Mobiltech	Oekeotech	Packtech	Protech	Sporttech
	(7)	(8)	(9)	(10)	(11)	(12)
Poly vinyl alcohol (PVA)	Sutures				Irridescent tent	Fishing nets
Poly butylene terephthalate (PBT)						Sportswear and active wear for kids
Poly Ether Ether Ketone (PEEK)	Medical tools, bone replacement	Aerospace components			High temperature resistant fabrics	Tennis racket strings
Polyphenylidine Sulphide (PPS)					High temperature resistant fabrics	
Aramid		Commercial vehicle, hoses, driving belts, air springs tyres, Composite for body work			High temperature resistant fabrics , encapsulating suits, mechanical protection, Ballistic protection, military helmets, protective vests	Marine and Sporting goods
Ultra high modulus PE					Ballistic protection	Sails for marine applications, balloons for stratospheric application

Fibre	Medtech	Mobiltech	Oekeotech	Packtech	Protech	Sporttech
	(7)	(8)	(9)	(10)	(11)	(12)
Poly Urethane (PU)	Bandages, surgical hosiery				Gloves	Ski pants, athlete's apparel
Carbon	Artificial ligaments	Composite for body work			Radiation protection	Tennis rackets
Glass	Surgical masks	Composite for body work			High temperature resistant fabrics	
Asbestos					High temperature resistant fabrics	
Poly tetra fluoro ethylene (PTFE)	Sutures, cardiovascular implants, soft tissue implants				High temperature resistant fabrics	
Ceramic					High temperature resistant fabrics , hard armour ballistic protection	
Silicone	Orthopedic implants, artificial cornea/contact lenses, artificial lungs				Gloves	

Appendix-3B (Contd..)

Fibre	Medtech	Mobiltech	Oekeotech	Packtech	Protech	Sporttech
	(7)	(8)	(9)	(10)	(11)	(12)
Phenolic		Disc pads and clutch facings			High temperature resistant fabrics , hoods, gloves, fire fighting garments, sleeping bags	
Polybenzimidazole (PBI)					High temperature resistant fabrics , protection from flame, chemical resistant fabrics , space suits	
Metallic					Electrical protection	
Arimid P 84					Flame retardant, thermal insulation clothing	
Polystyrene				Films, sheeting		
Melamine-formaldehyde					Heat and flame protective apparel	
Poly Vinylidene chloride (PVDC)		Car seat covers, public vehicle upholstery				
Polyphenelebenzobisoxazole (PBO)						Composites for athletic equipment

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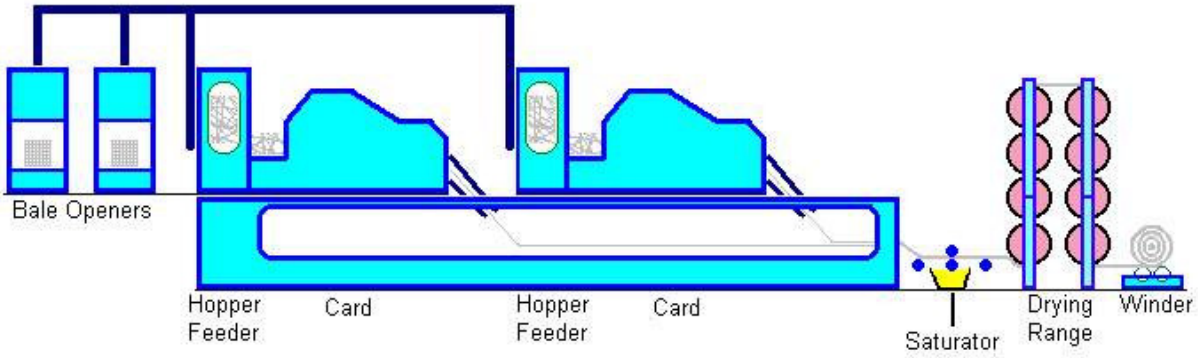
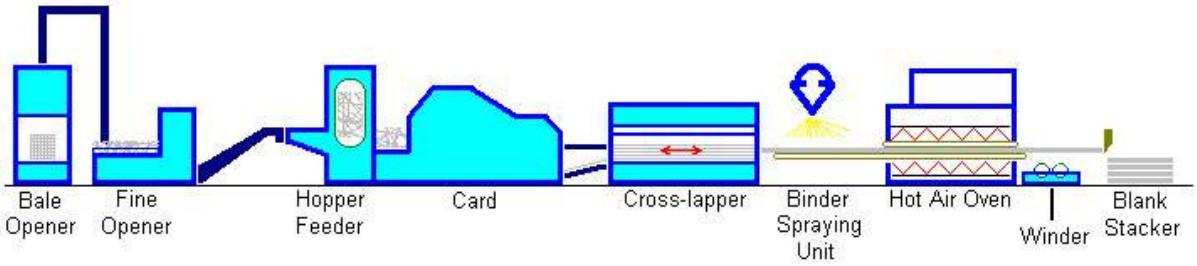
Appendix– 4(A)

Manufacturing processes of some nonwovens

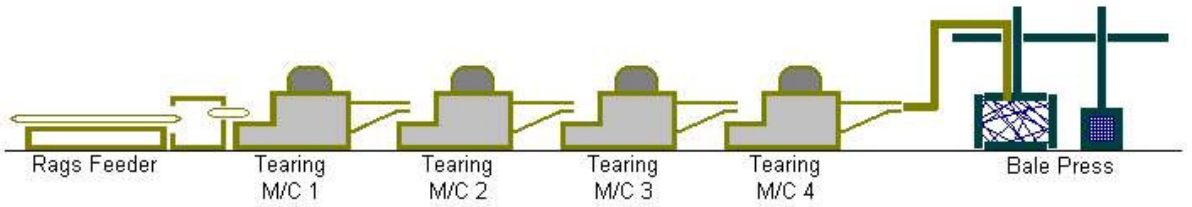
Chemical Bonded Interlinings

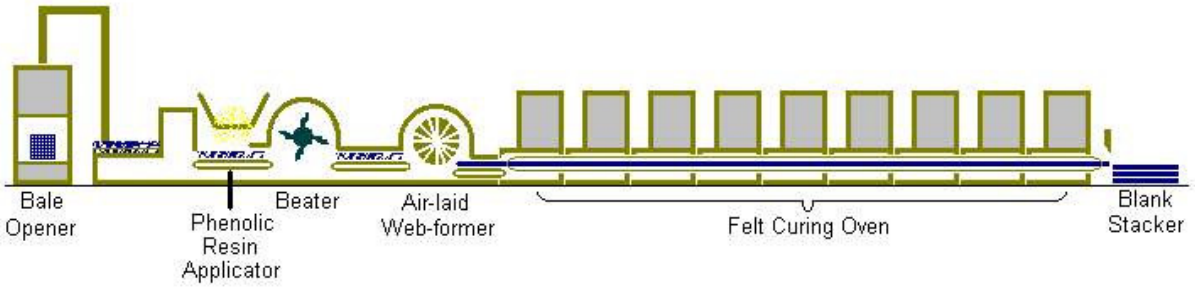


Chemical Bonded Waddings



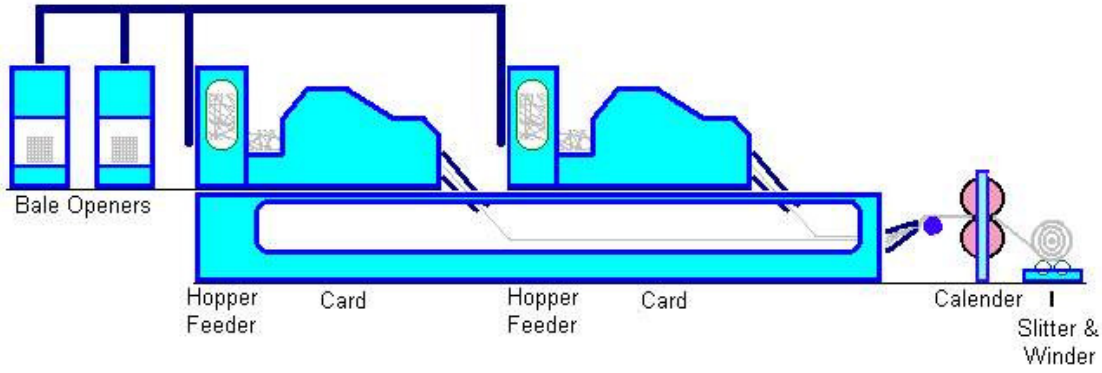
Resin Bonded Felts



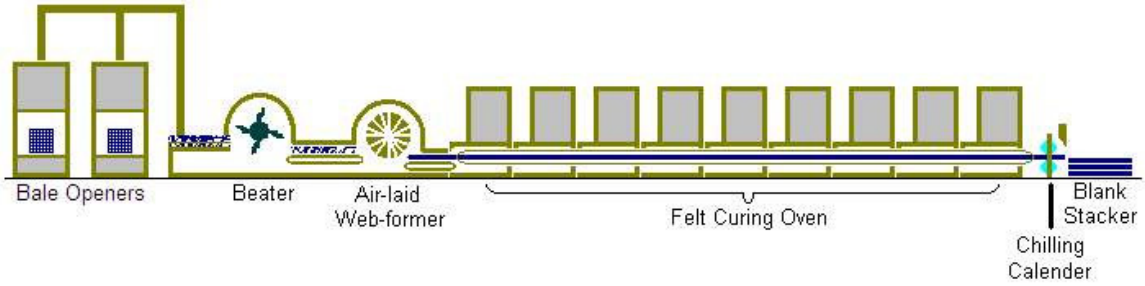


Appendix– 4(A) (Contd..)

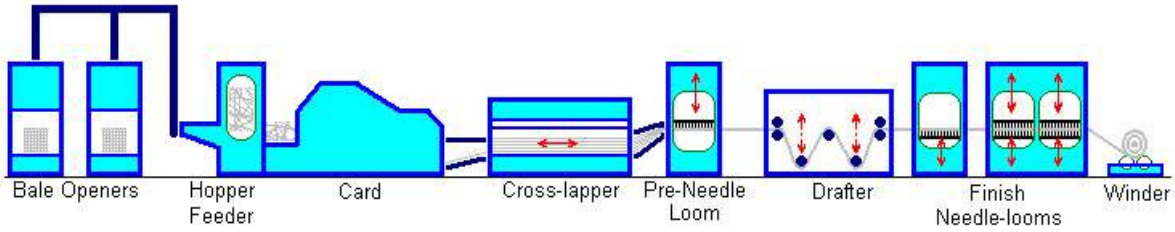
Thermal Bonded Interlinings



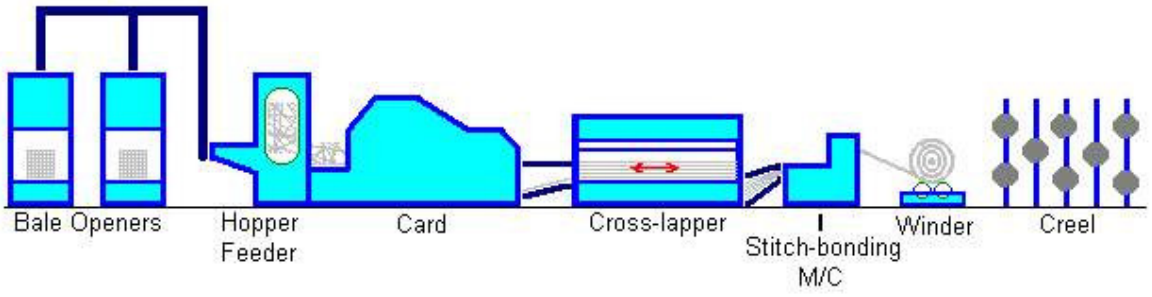
Thermal Bonded Felts



Needle Punched Nonwoven Fabrics



Stitch Bonded Nonwoven Fabrics



Appendix – 6A

No.24/1/2004-A&MMT

Government of India
Ministry of Textiles
***

New Delhi, Udyog Bhavan.
12th Nov., 2003.

OFFICE MEMORANDUM

Subject : Constitution of an Inter-ministerial Committee under the Chairmanship of Secretary (Textiles) on Technical Textiles.

The Expert Committee on Textile Policy had in its report of August 1999 highlighted the potential of technical textiles in the country and made strong recommendation for promoting its growth to enable India to create a place for itself in the international technical textile scenario. Subsequently, the New Textile Policy-2000 (NTxP-2000) has also stressed the need for the growth and development of technical textiles in the country. The recommendations of the Expert Committee on Textile Policy, however, were not found adequate by the Government to formulate an action plan for exploiting the opportunities of technical textiles. The Ministry of Textiles, therefore, on 4th July, 2002, constituted an Expert Committee on Technical Textiles (ECTT) exclusively for growth and development of technical textiles.

2. An interim report on the development of technical textiles has been submitted by the committee on 12.8.2003. A copy of the same is enclosed. In preparing its report, the ECTT made concerted efforts to collect reliable database on the status and potential of technical textile in the country for authentic inputs to it and held interactive sessions with the institutional users like Ministry of Health & Family Welfare, Road Transport & Highways, Chemicals & Petrochemicals, Water Resources, Defence and Home Affairs, Heaving Industry & Public Enterprises, etc. The examination of the report showed that the ECTT has made substantive recommendations which may serve as a strong tool for us to chalk out suitable programme for increasing the development and use of technical textiles in the country. Considering the numerous valuable suggestions made by the committee with the far reaching consequences towards growth and development of technical textiles in the country, with the approval of Hon'ble Minister of textiles, following Inter-ministerial Committee under the Chairmanship of the Secretary (Textiles) to examine the recommendations of the report of the ECTT for smooth implementation of action plan recommended in the report has been constituted:

1.	Secretary (Textiles)	-	Chairman
2.	Secretary, Deptt. of Expenditure	-	Member
3.	Secretary, Health & Family Welfare	-	Member
4.	Secretary, Road Transport & Highways	-	Member
5.	Secretary, Chemicals & Petrochemicals	-	Member
6.	Secretary, Water Resources	-	Member
7.	Secretary, Defence	-	Member
8.	Secretary, Home Affairs	-	Member
9.	Secretary, Heavy Industry & Public Enterprises	-	Member
10.	Secretary, Planning Commission	-	Member
11.	Director, Northern India Textile Research Association	-	Member
12.	Director, Ahmedabad Textile Research Association		
13.	Director, South India Textile Research Association	-	Member
14.	Director, Indian Jute Industry's Research Association		
15.	Director, Wool Research Association	-	Member
16.	Director, Man Made Textile Research Association	-	Member
17.	Director, Synthetic & Art Silk Mills Research Association	-	Member
18.	Director, The Bombay Textile Research Association	-	Member
19.	Textile Commissioner	-	Member Secretary

3. A suitable officer, not below the rank of Joint Secretary, may be nominated from the Deptt./Ministry. The nominations may please be sent to this Ministry latest by 30th November, 2003.

Sd/-
(P.K.Gera)
Director

To,

1. Secretary, Deptt. of Expenditure
2. Secretary, Health & Family Welfare
3. Secretary, Road Transport & Highways
4. Secretary, Chemicals & Petrochemicals
5. Secretary, Water Resources
6. Secretary, Defence
7. Secretary, Home Affairs
8. Secretary, Heavy Industry & Public Enterprises
9. Secretary, Planning Commission
10. Textile Commissioner, Mumbai.

Copy for information to :

1. Director, Northern India Textile Research Association, Ghaziabad (U.P.).
2. Director, Ahmedabad Textile Research Association, Ahmedabad (Gujarat).
3. Director, South India Textile Research Association, Coimbatore (Tamilnadu).
4. Director, Indian Jute Industry's Research Association, Kolkata (West Bengal).
5. Director, Wool Research Association, Mumbai (Maharashtra).
6. Director, Man Made Textile Research Association, Surat (Gujarat).
7. Director, Synthetic & Art Silk Mills Research Association, Mumbai (Maharashtra).
8. Director, The Bombay Textile Research Association, Mumbai (Maharashtra).

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Appendix – 6B

LIST OF COMMON TESTING FACILITIES SUGGESTED BY TECS FOR IDENTIFIED 25 PRODUCTS

Sr. No.	Test Parameters	Specification Standard	*Equipments*	Major Suppliers
NEEDLE PUNCHED PROJECT ***(includes Geotextiles, Filtration Products, Sports Footwear Components, Geomembrane, Headliners, Carpets, etc.)***				
1.	Std. Atmosphere for Geotextiles	ISO554	Conditioning cabinet	BT Technology, USA, SDL, UK, Local co. In Mumbai
2.	*Effective aperture size	E DIN EN ISO 12956: 1996-02, EN ISO 12956: 1999-02, ISO 12956: 1999-02, ASTM: D4751-95, BSEN: 6906, ISO: 12956, BIS: IS:14294	Mechanical Sieve shaker, Balance, Drying Oven, Spherical Glass Beads	Sieve shaker (TASS)
3.	*Mass Per Unit Area	ASTM: D5261-92, BS EN 965: 1995-03, ISO 9864: 1990-09, DIN EN 965: 1995-05, BIS: IS: 1964	Weighing Balance Weight Box & Scissor	AIMIL, India
4.	*Thickness Individual Layer Multilayer	ASTM: D5199-91, DIN EN 964-1: 1995-05, PrEN 964: 1992-12, EN 964-1: 1995-03, ISO 9863: 1990-10, BIS IS 13162 (Part 3) DIN EN ISO 9863-2: 1996-10, prEN 964-2: 1995-11, EN ISO 9863-2: 1996-08, ISO 9863-2: 1996-08, BIS IS 13162 (Part 3)	Thickness gauge with variable load	BT Technology, USA SDL, UK, AIMIL, India
5.	*Breaking strength / elongation			
	50 mm wide	DIN EN 29073-3: 1992-08, EN 29073-3: 1992-06, ISO 9073-3: 1999-02, ASTM:D4595-86 (1994) BSEN: 6906 (part 1)	Tensile Tester with Load Cells, Extensometer/Gauge Dial/L.V.D.T.	Universal tensile tester Shimadzu BT Technology, USA SDL, UK, Hounsfield, UK, INSTRON, UK ZWICK, India
	200 mm wide	DIN EN 10319:1996-06, EN ISO 10319: 1996-05, ISO 10319: 1993-04		
	Seams/joints	DIN EN ISO 10321: 1996-06, EN ISO 10321: 1996-05, ISO 10321: 1992-12		

** indicates the essential test facilities required for ascertaining the product quality during manufacturing.*

Sr. No.	Test Parameters	Specification Standard	*Equipments*	Major Suppliers
6.	*Multi-axial Tension Test	ASTM:D5671-94	Tensile Tester	BT Technology, USA. SDL, UK, Hounsfield, UK, INSTRON, UK, ZWICK, India, Universal tensile tester Shimadzu, Katotech, Japan
7.	*Trapezoid Tear Strength	ASTM: D4533-91 BIS: IS: 14293	Tensile Testing Machine & Trapezoidal Template	Universal tensile tester Shimadzu, BT Technology, USA SDL, UK, Hounsfield, UK, INSTRON, UK, ZWICK, India
8.	*Grab Tensile Test	ASTM:D4632-91	Tensile Tester	BT Technology, USA, SDL, UK, Hounsfield, UK, INSTRON, UK, ZWICK, India, Universal tensile tester Shimadzu
9.	Tensile Creep	E DIN EN ISO 13431: 1996-01, prEN ISO 13431: 1998-02, ISO/FDIS 13431: 1998-02, ASTM: D5262-92	Creep Strength Tester	BT Technology, USA AIMIL, India
10.	Shear Creep	EN 1897	Creep Strength Tester	BT Technology, USA AIMIL, India
11.	Compressive Creep with Normal Load	DIN V EN 1897: 1996-03, ENV 1897: 1996-01	Creep Strength Tester	BT Technology, USA AIMIL, India
12.	*Index Puncture Resistance	ASTM:D4833-88, DIN: 54307 BSEN: 6906 (Part4), ISO: 12236 BIS: IS:13162 (Part 4)	CBR puncture resistance tester (attachment)	
13.	Abrasion behaviour	DIN EN ISO 13427: 1998-10, EN ISO 13427: 1998-08, ISO 13427: 1998-08, ASTM:D4886-88(1995)	Abrasion Tester	(Martindale Abrasion Tester (Eureka) Abrasion tester (Taber)
14.	Resistance to oxidation (Oven test, -40^0C to 100^0C)	ENV ISO 13438: 1999-02, ISO/TR 12960: 1998-11	Environmental chamber for thermal resistance	Thermolab, Mumbai
15.	Resistance to Liquid media	DIN V ENV ISO 12960: 1999-02, ENV ISO 12960: 1998-11, ISO/TR 12960: 1998-11, EN 14030 ASTM: D5322-92	Exposure Tank & Chemicals	-

* *indicates the essential test facilities required for ascertaining the product quality during manufacturing.*

Sr. No.	Test Parameters	Specification Standard	*Equipments*	Major Suppliers
16.	Pullout Resistance in Soil	prEN 13738	Pull-out Resistance Tester	BT Technology, USA
17.	Coefficient of Soil & Geosynthetic Friction	ASTM: D5321-92	Direct Shear Test Equipment	BT Technology, USA AIMIL, India
18.	*Ultraviolet Degradation	ASTM:D4355-92 BIS: IS:13162 (Part 2)	Xenon-Arc Apparatus/Quick UV Tester	Quick UV tester (Atlas UV2000)
19.	Weathering Resistance	DIN V ENV 12224: 1996-12, ENV 12224: 1996-10, ASTM D 4355-92, IS 13162 (Part 2)	Xenon-Arc Apparatus/Quick UV Tester	ATLAS, SDL, UK, ATI Corp., USA
20.	Resistance To Microbiological Degradation	DIN V ENV 12225: 1996-12, ENV 12225: 1996-10	Microbial Tester	-
21.	Frictional characteristics		-	-
	Shear box	E DIN EN ISO 12957-1: 1998-04, prEN ISO 12957-1: 1997-12, ISO/DIS 12957-1: 1997-12		
	Slope, plane	E DIN EN ISO 12957-2: 1998-04, prEN ISO 12957-2: 1997-12, ISO/DIS 12957-2: 1997-12		
22.	Soil Burial Test	EN 12225	Test accessories	-
23.	*Water permeability k_V		Water permeability tester under load	In plane water permeability tester (AIMIL)
	Without a load	E DIN EN 12040: 1995-09, prEN 12040: 1995-07, EN ISO 11058: 1999-02, ISO 11058: 1999-02		
	With a load	E DIN 60500-4: 1997-02, ASTM D: 4491-92, BS EN 6906 (Part 3)		
24.	Water permeability k_H		Water permeability tester	In plane water permeability tester (AMMIL)
	Parallel	E DIN EN 12958: 1996-02, EN ISO 12958: 1999-02, ISO 12958: 1999-02		
	Radial	E DIN 60500-8: 1997-03		
25.	Air Permeability	ASTM D3786-87	HP Air Permeability Tester	Textocraft, Shirley AP tester, Textech

* *indicates the essential test facilities required for ascertaining the product quality during manufacturing.*

Sr. No.	Test Parameters	Specification Standard	*Equipments*	Major Suppliers
		Filtration Products		
26.	*Particulate air filtration efficiency	DIN EN 779: 1994-09	Air filtration efficiency tester & synthetic dust (N.A.)	-
27.	Test for particle filtration	E DIN 71 460-1: 1993-06		-
28.	Filter media test	VDI 3926, Sheet 1: 1994-12		BWF Textil GmbH & Co Filtertechnik GmbH
29.	Bubble point and mean flow pore test	-	Bubble point tester	PMI
30.	*Arrestance test for filters	-	Arrestance tester	SDL
31.	Thermal resistance	-	Oven	SDL Heal
		GEO-GRID		
1.	*Characteristic Mesh Size (Aperture Size)	EN ISO 12956	Laboratory microscope	-
2.	*Mass Per Unit Area	ASIM: D5261-92 BSEN:965 ISO:9864 BIS: IS: 1964	Weighing Balance Weight Box & Scissor	BT technology, USA SDL,UK AIMIL,INDIA
3.	*Tensile Properties (Wide-Width Strip)	ASTM:D4595-86 (1994) BSEN: 6906 (part 1) ISO: 10319 IS:13162 (Part 5)	Tensile Tester with Load Cells, and specialized grips	BT Technology,USA SDL,UK Hounsfield, UK INSTRON,UK ZWICK,INDIA
4.	*Multi-axial Tension Test	ASTM:D5671-94	Tensile Tester and specialized attachment	BT echnology,USA SDL,UK Hounsfield, UK INSTRON,UK ZWICK,INDIA
5.	Pullout Resistance in Soil	EN 13738	Pull-out Resistance Tester	BT Technology,USA
6.	*Coefficient of Soil & Geosynthetic Friction	ASTM: D5321-92	Direct Shear Test Equipment	BT Technology,USA AIMIL,INDIA
7.	Tensile Creep	EN ISO 13431 ASTM: D5262-92 IS 14324: 1995	Tensile Creep Tester with Extensometer	BT Technology,USA AIMIL,INDIA
8.	Shear Creep	EN 1897	Creep Strength Tester	-
9.	Compressive Creep with Normal Load	EN 1897	Creep Strength Tester	-
10.	*Ultraviolet Degradation	ASTM:D4355-92 BIS: IS:13162 (Part 2)	Xenon-Arc Apparatus/Quick UV Tester	Quick UV tester (Atlas UV2000) SDL,UK ATI CORP. USA
11.	Resistance to Weathering	EN 12224	Xenon-Arc Apparatus/Quick UV Tester	Quick UV tester (Atlas UV2000) SDL,UK ATI CORP. USA

* *indicates the essential test facilities required for ascertaining the product quality during manufacturing.*

Sr. No.	Test Parameters	Specification Standard	*Equipments*	Major Suppliers
12.	Resistance to Liquids	EN 14030 ASTM:D5322-92	Exposure Tank & Chemicals	-
13.	Thermal Oxidation Test (Oven test, -40^{0}C to 100^{0}C))^R	ENV ISO 13438: 1999	Environmental chamber for thermal resistance*(attachment)*	-
14.	Soil Burial Test	EN 12225	Test accessories	Soil Burial Test
SEAT BELT WEBBINGS AND OTHER RIGID WEBBINGS ***(Includes Seat Belts, Webbings For Industrial Uses, Parachutes And Zip Fastners)***				
1.	*Tensile strength and elongation	BS-5053-1986 IS:1969-1985 ASTM:D5035-90	Tensile testing machine Long Span Tensile Tster	Shimadzu, Instron, Zwick
2.	Bending length	ASTM D1338-96	Stiffness tester	SASMIRA SDL Instruments Paramount
3.	Water repellency	IS: 392-1975	Bundesmann apparatus	Prolific, SDL
4.	Surface Resistivity (antistatic)	ASTM D-4238-1998 AATCC 76-1978 DIN EN1149-1:1996-01	Honestometer Surface resistivity meter	Shishido corp., Japan AATCC
5.	*Flammability resistance	DIN 75200 IS:11871	Flame testing box with the burner	ICHAHA
6.	*Fabric weight measurement	DIN 53353	Measuring balance	Precisa Paramount
7.	*Fabric thickness measurement	DIN 53352	Thickness tester	SDL Instruments
8.	*Length and width of fabrics	IS:1954-1969	Measuring table Measuring scale	
9.	Dimensional stability	DIN 53894 ASTM:D6207-97	Environmental test chamber	
10.	*Abrasion resistance	IS-12673 ASTM: D4966	Martindale Abrasion tester	SDL Instruments Paramount
11.	*Static load test (Elastic)	ASTM:D5278-92	Tensile Tester	Textechno, Instron
12.	*Cyclic load test	ASTM:D4694-94	Tensile Tester	Textechno, Instron
13.	UV resistence test	ASTM:G151	Q-UV tester	Atlas & Q Sun
14.	Ageing test	-	Drying oven	SDL
COATED AND LAMINATED TEXTILES ***(Includes Hoardings & Signage, Soft luggage material, Awnings and canopies, parachute fabrics, air balloons, Automotive Air bags, Coated FR textiles tafetta fabrics, Tarpaulin, Tents etc.)***				
1.	*Coating Mass Per Unit Area	BS 3424, IS 7016 Part 1	Templates, balances	INDLABS
2.	*Degree of fusion /Curing of coating	BS 3424, ASTM D 4005-81	Oven	Therelek, Heraeus etc.
3.	*Blocking	BS 3424, IS 7016 Part 9	Oven	Therelek, Heraeus etc.
4.	*Coating Adhesion	BS 3424, IS 7016 Part 5, ASTM D751	UTM	Shimadzu/ Instron
5.	*Accelerated Ageing	BS 3424, IS 7016 Based on ISO/R1419-1970	Oven	Therelek, Heraeus etc.

** indicates the essential test facilities required for ascertaining the product quality during manufacturing.*

Sr. No.	Test Parameters	Specification Standard	*Equipments*	Major Suppliers
6.	Flexibility- Flat Loop Method	IS 7016 Part 11 Based on ISO/R5979-1982	-	To be fabricated
7.	*Damage due to Flexing	BS 3424, IS 7016 Part 4, ASTM D2097	Flex abrasion M/c	SDL
8.	*Abrasion Resistance	BS 3424, ASTM D 3389	Flat abrasion tester	SDL
9.	*Test for Colourfastness to dry and wet rubbing	BS 3424, IS1259	Crockmeter	SASMIRA, AATCC
10.	Low Temperature Bend Test	ASTM D 2136, IS 7016 part 10, Based on ISO 4675-90	As per fabrication	
11.	Low temperature Impact test	AS 3424, ASTM D-2137, IS 7016 part 14	As per fabrication	
12.	*Cone Test	IS7941	Cone, measuring cylinder	To be fabricated
13.	*Resistance of Water Penetration	ASTM –D-751, BS3424, IS 7016 Part 7	Mullen type hydrostatic tester	-
14.	Air permeability	BS 3424	AP tester	SDL/Techtex
15.	Water vapour Permeability	ASTM E 96-80	WVP tester	SDL / Sensora
16.	Resistance to Permeation by Hazardous Liquid Chemicals	ASTM F 739-96	UV IR spectrophotometer, chromatograph	Varian, Shimadzu
17.	Resistance to Penetration By blood born Pathogens	ASTM F1671-97 b	Suitable Biological testing accessories	-
18.	Electrical resistively of the fabric	AATCC 76-1995	Resistivity meter/ Honestmeter	Shishido Electrostatic, Ltd.
19.	*Tensile strength/ Tear strength	IS 7016	UTM	Shimadzu
20.	*Bursting strength	IS 1966	Bursting strength tester	SDL/ Ubique
21.	*UV resistance	ASTM G 151	Q-UV, Atlas 2000	Atlas/ Q-sun
22.	Light fastness	AATCC-16-93, IS-2454	Xenotest/ Light fastness tester	SASMIRA/ Atlas
23.	Dynamic AP (Air bags)	ASTM D – 6476-00	Dynamic AP tester	Tex techno, Textest
INCONTINENCE PRODUCTS ***(includes sanitary napkins, incontinence adult diapers and baby diapers)***				
	Physical			
1.	*Weight	ASTM D 6242-98, ISO 9073-1:1989, DIN EN 29073 - 1:1992-08	Analytical balance	Mettler, Precisa
2.	*Thickness	ISO 9073-2:1997, ASTM D - 5729 - 97	Thickness Meter	SDL, Paramount
3.	Air Permeability (Biaxial Fensile Prop.)	ISO 9237:1995-12	Air Permeability Tester	SDL, Testtex (Textest)
4.	Water Vapour Permeability	ASTME - 96-80	Water Vapour Permeability Tester	SDL, CSI

* *indicates the essential test facilities required for ascertaining the product quality during manufacturing.*

Sr. No.	Test Parameters	Specification Standard	*Equipments*	Major Suppliers
5.	*Tear Strength	ASTM D - 5735-95, D 5733-97, ISO 9073-4:1997	UTM	Instron, Shimadzu, Zwicki
6.	*Abrasion (Flex)	ASTM D - 3885	Flex abrasion tester	Taber, Stoll
7.	Electrical Resistivity (Electric Resistance of Textile Materials)	ASTM D - 4238-1998, ASTCC 76-1978, DIN EN 1149-1:1996-01	Honestometer, Surface Resistivity Meter	Shishido Electrostatic, Pillip
	Chemcial			
8.	Liquid Penetration	DIN EN 368:1993 - 01	Glassware & Chemicals	
9.	Liquid Permeation	DIN EN 368:1993 - 04	Glassware & Chemicals	
10.	*Liquid Absorption	ASTMF - 1819-97	Glassware &	
11.	Liquid Storage Capacity	ISO 9073 - 6	Glassware & Chemicals	
12.	Water Resistance (Hydrostatic Test)	AATCC 127-1977, BS 2823:1957	Hydrostatic Dome Tester	SASMIRA
13.	*Wet Back	ISO 9037 - 8:1995, EDANA 151.2 - 99	Lister	Lenzing
14.	Flame Retardancy	BS 3119, IS 11871, AATCC 33-1962 ASTM D 2633, D2863 ASTM D 1230	Vertical Flammability Tester Inclined Flammability Tester	CSI, Paramount CSI, Paramount
15.	Flame Retardancy (LOI Method)	ASTM D 4723 - 1998 IS 13501 - 1992	LOI Tester	Atlas, Paramount
16.	*Disposability	Non standard test - dissolution of absorbent core in 15 lts of water in 5 minutes	Glassware & Chemicals	
	Biological			
17.	Skin Irritation	ASTM F 19 - 81	Chemicals, test animals	
18.	*Microbial Resistance (Bacterial, Fungal, Mildew, Insects)	ASTMD - 4576, BS 1425 AATCC 100 - 1997, AATCC 30-1979, AATCC 24 - 1977	Chemicals, culture medium, incubator	Merck, Lauda
HEALTHCARE DISPOSABLES				
	Physical			
1.	*Weight	ASTM D – 3376, IS 1964: 1970, D 6242-98, ISO 9073-1:1989, DIN EN 29073-1:1992-08	Analytical balance	Mettler, Presica
2.	*Thickness	ASTM D – 1777, IS 7702:1975, ISO 9073-2:1997, ASTM D – 5729 – 97	Thickness Meter	SDL , Paramount,
3.	*Air Permeability	ASTM D – 737, IS 11056:1984, ISO 9237:1995-12	Air Permeability Tester	SDL ,Testex, CSI
4.	*Water Vapour Permeability	ASTM E - 96-80	Water Vapour Permeability Tester	SDL , CSI

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Sr. No.	Test Parameters	Specification Standard	*Equipments*	Major Suppliers
5.	*Tensile Strength	ASTM D- 5035:1995, ISO 5081:1997-03, IS: 1969:1985, ISO 9073-3:1989	UTM	Instron, Shimadzu, Zwicki
6.	*Tear Strength	ASTM D – 2261-96, D – 5587-96, D 5735-95, D 5733-97, ISO 9073-4:1997	UTM	Instron, Shimadzu, Zwicki
7.	Drape Coeff.	ISO 9073-9:1995	Drape Meter	SDL , BTRA
8.	Stiffness	ASTM D – 1388, ASTM D – 5732-95, ISO 9073-7:1995	Bending Length Tester	SDL , SASMIRA
9.	Abrasion (Flex)	ASTM D – 3885,	Flex abrasion tester	Atlas, Taber, Stoll
10.	*Abrasion (Flat)	ASTM D – 4966-98, ISO 12947 – 2:1999	Martindale Abrasion Tester	Eureka, Atlas
11.	Electrical Resistivity	ASTM D – 4238-1998, AATCC 76-1978, DIN EN 1149-1:1996-01	Honestometer, Surface Resistivity Meter	Shishido Electrostatic
	Chemcial			
12.	*Liquid Penetration	DIN EN 368:1993 – 01	Glassware & Chemicals	
13.	Liquid Permeation	DIN EN 368:1993 – 04	Glassware & Chemicals	
14.	*Water Resistance (Spray Test)	AATCC 22-1977, ASTM D – 583 – 58	Spray Tester	AATCC, SASMIRA
15.	Water Resistance (Hydrostatic Test)	AATCC 127-1977, BS 2823:1957	Hydrostatic Dome Tester	SASMIRA
16.	*Flame Retardancy	BS 3119, IS 11871, AATCC 33-1962 ASTM D 2633, D2863 ASTM D 1230	Vertical Flammability Tester Inclined Flammability Tester	CSI, Paramount CSI, Paramount
17.	Flame Retardancy (LOI Method)	ASTM D 4723 – 1998 IS 13501-1992	LOI Tester	Atlas, Paramount
18.	*Launderability	ASTM D – 4721 – 1998, AATCC , DIN 54 304:1991-02	Launderometer	IFB, SASMIRA, Labin
19.	*Dimensional Stability	AATCC 135-1978	Launderometer	IFB, SASMIRA
	Biological			
20.	Skin Irritation	ASTM F 19 – 81	Chemicals, test animals	
21.	*Microbial Resistance (Bacterial, Fungal, Mildew, Insects)	ASTM D – 4576, BS 1425 AATCC 100 – 1997, AATCC 30-1979, AATCC 24 – 1977	Chemicals, culture medium, incubator	Merck. Lauda
22.	*Resistance of protective clothing material to synthetic blood	ASTM ES – 21-1992	Pressure gauge, chemicals	
23.	*Resistance protective clothing material to blood borne pathogens using viral penetration	ASTM ES – 22-1992	Pressure gauge, chemicals, culture medium	

* *indicates the essential test facilities required for ascertaining the product quality during manufacturing.*

Sr. No.	Test Parameters	Specification Standard	*Equipments*	Major Suppliers
SPUN BOND PROJECT				
1.	*Thickness	ASTM: D5199-91 BSEN: 964 –1 ISO: 9863 BIS: IS:13162 (Part3)	Thickness gauge with variable load	BT technology, USA SDL,UK AIMIL,INDIA
2.	*Mass Per Unit Area	ASIM: D5261-92 BSEN:965 ISO:9864 BIS: IS: 1964	Weighing Balance Weight Box & Scissor	BT technology, USA SDL,UK AIMIL,INDIA
3.	*Apparent Opening Size (Dry Sieving)	ASTM:D4751-95	Dry Sieve Apparatus	W.S.Tylor, Germany BT Technology, USA AIMIL,INDIA
4.	*Apparent Opening Size (Wet Sieving)	ASTM:D4751-95	Wet sieve Apparatus	W.S.Tylor, Germany BT Technology, USA AIMIL,INDIA
5.	*Abrasion	EN ISO 13427 ASTM:D4886-88(1995)	Abrasion Tester	(Martindale Abrasion Tester (Eureka) Abrasion tester (Taber)
6.	*Index Puncture Resistance	ASTM:D4833-88 DIN: 54307 BSEN: 6906 (Part4) ISO: 12236 BIS: IS:13162(Part 4)	Tensile tester and attachments	BT technology, USA SDL,UK AIMIL,INDIA SHIMADZU,JAPAN
7.	*Bursting Strength	ASTM: D 3786	Diaphrgm/Mullnt Type Byrsting Tester	BT technology, USA SDL,UK
8.	*Trapezoid Tear Strength	ASTM: D4533-91 IS: 14293	Tensile Testing Machine & Trapezoidal Template	BT Technology,USA SDL,UK Hounsfield, UK INSTRON,UK ZWICK,INDIA
9.	Air Permeability	-	HP Air Permeability Tester	Textocraft
10.	Water Permeability by Permittivity	ASTM:D4491-92 DIN: 60500-4 BSEN: 6906 (Part 3) ISO: 11058 BIS: IS:14324	Water permeability tester without load	In plane water permeability tester (AIMIL)
11.	Water Vapour Permeability	ASTM:E 96-80	Water vapour Tester	Water vapour permeability tester (SDL)
12.	*Tensile Test (nonwovens)	EN ISO 10319	Tensile Testing Machine	Universal tensile tester Shimadzu-AGS 500Kg.
13.	Tensile Test (High-strength non-woven Products)	EN ISO 10319	Tensile Testing Machine	BT Technology,USA SDL,UK, Hounsfield, UK, INSTRON,UK ZWICK,INDIA

** indicates the essential test facilities required for ascertaining the product quality during manufacturing.*

Sr. No.	Test Parameters	Specification Standard	*Equipments*	Major Suppliers
14.	*Grab Tensile Test	ASTM:D4632-91	Tensile Tester and specialized grips	BT Technology,USA SDL,UK Hounsfield, UK INSTRON,UK ZWICK,INDIA
15.	Tensile Test for Joints/Seams (by Wide Width Method)	ISO10321:1992(E) IS15060:2001	Tensile Tester and specialized grips	BT Technology,USA SDL,UK Hounsfield, UK INSTRON,UK ZWICK,INDIA
16.	*Ultraviolet Degradation	ASTM:D4355-92 BIS: IS:13162 (Part 2)	Xenon-Arc Apparatus/Quick UV Tester	Quick UV tester (Atlas UV2000) SDL,UK, ATI CORP. USA
17.	Resistance to Weathering	EN 12224	Xenon-Arc Apparatus/Quick UV Tester	Quick UV tester (Atlas UV2000) SDL,UK, ATI CORP. USA
SPUN LACE PROJECT				
1.	*Linear density of fibre	DIN EN ISO 1973: 1995-12, DIN 58811: 1970-07	Vibroscope	Lenzing, Textechno
2.	*Length of fibres	DIN 53 808-1: 1982-02	Fibrograph	Lenzing, Prenvier Textechno
3.	*Breaking force & elongation of fibres	DIN EN ISO 5079:1996-02, DIN ISO 3060: 1994-04, ÖTN	Fibre strength tester	Lenzing, Textechno, SDL
4.	*Mass per unit area	DIN EN 29073-1: 1992-08, ISO 9073-1:1989, D6242-98	Analytical balance	Mettler, Ohaus, Paramount
5.	*Thickness of nonwoven	DIN EN ISO 9073-2: 1997-02, ASTM 5729-97, D5736-95	Thickness meter	SDL, James H Heal Co. Ltd., Paramount
6.	*Tensile strength & elongation	DIN EN 29073-3: 1992-08, D 5034-95, D5035-95	Tensile strength tester	Shimadzu Zwick, Instron
7.	Bending length	DIN EN ISO 9073-7:1998-10, D5732-95, ISO 9073-7:1995	Bending length tester	SDL, SASMIRA, Paramount
8.	*Bursting strength & bursting distention	DIN EN ISO 13938-2:1999-10	Bursting strength tester	SDL, James H heal Co., Lloyd instruments
9.	Air permeability	DIN EN ISO 9237: 1995-12, D 737-96, EDANA 140.1-99, EN ISO 9237:1995	Air permeability tester	SDL, Prolific
10.	*Tear strength	DIN EN ISO 9073-4:1997-09, D5733-99, D5734-95, D5735-95	Tear strength tester	Shimadzu, SDL, Instron
11.	Abrasion resistance	DIN EN ISO 12947-2:1999-04, D 3885-99	Abrasion tester	Martindale, Eureka, Paramount

* *indicates the essential test facilities required for ascertaining the product quality during manufacturing.*

Sr. No.	Test Parameters	Specification Standard	*Equipments*	Major Suppliers
12.	Colour fastness to light	DIN EN ISO 105-B02: 1999-09,AATCC 161993	Xenon tester	SASMIRA, Atlas, Q -Sun
13.	*Wet barrier	EDANA 160.0-89	Hydrostatic head	SDL, James H Head Co., Ltd.,
14.	*Absorbency	EDANA 10.3-99, ISO 9073-6	Lister (Wet Back	Lenzing
15.	*Water vapour permeability	BS 7209	Water vapour permeability tester	SDL
16.	Water Repellency	EDANA 120.1-80, ISO 811:1981-EN 20811:1992	Spray tester	SASMIRA
17.	*Bacteria filtration efficiency	EDANA 180.0-89	BFE Tester	Lenzing
18.	*Dry bacteria penetration	EDANA 190.0-89	BFE Tester	Lenzing
	CIRCULAR KNITTED PRODUCTS ***(includes compression bandages, vascular grafts, etc.)***			
	Physical			
1.	*Weight	ASTM D - 3376, IS 1964:1970	Analytical balance	Mettler, Precisa
2.	*Thickness	ASTM D - 1777, IS 7702:1975	Thickness Meter	SDL, Paramount
3.	Air Permeability	ASTM D - 737, IS 11056:1984,	Air Permeability Tester	SDL, Testex CSI
4.	Water Vapour Permeability	ASTME - 96-80	Water Vapour Permeability Tester	SDL, CSI
5.	*Tensile Strength	ASTM D - 5035:1995, ISO 5081:1997-03, IS:1969:1985, ISO 9073-3:1989	UTM	Instron, Shimadzu, Zwicki
6.	*Tear Strength	ASTM D - 2261-96, D - 5587-96	UTM	Instron, Shimadzu, Zwicki
7.	Abrasion (Flex)	ASTM D - 3885	Abrasion tester	Stoll, Taber
	Chemical			
8.	Launderability	ASTM D - 4721 - 1998, AATCC, DIN 54 304:1991-02	Laundero-meter	IFB, SASMIRA, Labin
9.	* Dimentional Stability	AATCC 135 - 1978	Laundero-meter	IFB, SASMIRA
10.	Water Resistance (Hydrostatic Test)	AATCC 127-1977, BS 2823:1957	Hydrostatic Dome Tester	SASMIRA
11.	Flame Retardancy	BS 3119, IS 11871, AATCC 33-1962	Vertical Flammability Tester Inclined Flammability Tester	CSI, Paramount CSI, Paramount
12.	Flame Retardancy (LOI Method)	ASTM D 4723 - 1998	LOI Tester	Atlas, Paramount

** indicates the essential test facilities required for ascertaining the product quality during manufacturing.*

Appendix – 6B (Contd..)

Sr. No.	Test Parameters	Specification Standard	*Equipments*	Major Suppliers
	Biological			
13.	Skin Irritation	ASTM F 19 - 81	Chemicals, test animals	
14.	*Microbial Resistance (Bacterial, Fungal, Mildew, Insects)	ASTMD - 4576, BS 1425 AATCC 100 - 1997, AATCC 30-1979, AATCC 24 - 1977	Chemicals, culture medium, incubator	Merck, Lauda

* *indicates the essential test facilities required for ascertaining the product quality during manufacturing.*

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Appendix – 7A

List of specialized fibres / filament yarns

Sr. No.	Description
1.	Meta-Aramid Staple Fibre / Filament Yarn
2.	Fluoro Carbon Fibre (PTFE- Polytetra Fluoroethylene Staple Fibre / Filament Yarn
3.	Para-Aramid Staple Fibre / Filament Yarn
4.	Melamine Staple Fibre
5.	Polyamide Staple Fibre
6.	PAN based Carbon Staple Fibre
7.	Carbon Fibre Pitch based Staple Fibre
8.	Glass Staple Fibre / Filament Yarn
9.	Basalt Staple Fibre
10.	High Density Polyethylene (HDPE) Staple Fibre
11.	Epitropic Staple Fibre
12.	Stainless Steel Staple Fibre
13.	Polyphylene Sulfide Staple Fibre (PPS)
14.	Phenolic Staple Fibre
15.	Conductive Staple Fibre
16.	Bi-Component Staple Fibre
17.	Low Denier Polyproylene Staple Fibre (Below 2.5 Denier)
18.	PVA Staple Fibre (Polyvinyl Alcohol Staple Fibre) / filament yarn
19.	PBI (Polybenzimidazole) Staple Fibre
20.	PBO (Poly-Phenylenebenzobisoxazole) Staple Fibre
21.	Micro Denier Staple Fibre
22.	Seaisland type micro denier Staple Fibre
23.	Split type micro denier Staple Fibre
24.	Nano denier Staple Fibre
25.	Fire Retardant Polyester / Polypropylene Staple Fibre
26.	Low Melt Polyester Staple Fibre
27.	Fire Retardant Viscose Staple Fibre
28.	Moda Acrylic Staple Fibre
29.	Homopolymer Acrylic Staple Fibre
30.	Nylon (Polyamide) Staple Fibre
31.	Ceramic Fibres / Filament Yarn
32.	Optical fibres / Filament Yarn
33.	High tenacity and Low Shrinkage Polyester and Nylon Multi Filament Yarns
34.	Adhesive Yarns
35.	Spun Yarn of above listed High Performance Staple Fibre

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