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COLLEGE OF TEXTILE TECHNOLOGY

BERHAMPORE & SERAMPORE NORTH INDIA CHAPTER

CONTENTS

Editorial

It is utmost joy and pleasure to release the 2016 edition of TANTU on the occasion of fourth TANTU seminar on Technical Textiles organised by the north India section of alumni association of textile technocrats from Calcutta University. While we are proud to consolidate our effort in in addressing the untouched and unorganized 'manufactured textile market', I would like to thank the speakers to support our maiden effort on coming together in a platform to discuss the 'secret sauce' of this value added segment.

Although it is estimated that the market size for technical textile sector and it's products (all 12 categories together) will grow from $ 9.43 bn in 2011-12 to $23.66 bn in 2018-19, there is no breakup available about roll goods and manufactured products in India's technical textile sector. From the category wise break up it is clear that roll goods dominate the share. By the roll goods sector I mean the specialty fabric and raw materials commonly manufactured in 2D shape, and by manufactured sector consists of cut-n-join or 3D manufacturing of products for immediate customer use. Following the example from traditional textile sector it can very well be assumed that roll goods sector of technical textiles are the organized one and the manufactured sector of technical textiles are still the unorganized ones.

While the daylong seminar will bring together who's who in the manufactured technical textile sector, especially from Meditech and Protech, this magazine also put together their thoughts about the market, business challenges and innovative products. With Meditech and Protech is poised to reach a paltry $853 mn and $794 mn respectively by 2018-19, there is serious concern having no special focus of Government to these value added sectors. While meditech is going to get traction from increase in wellness expenditure, the Protech is likely to find mutil-stakeholder in manufacturing, services (like cold chain) and defense modernization. The scratching of the surface of manufactured sector reveals some interesting trends like Maharashtra is the popular destination for both Meditech and Protech, while Kolkata continues to share a sizable chunk in Protech. While fashion garment manufacturing proliferated through growth of natural clusters (though illogical) like Bangalore, Delhi, Tirupur, Ludhiana, Chennai, Mumbai, it is to be seen whether Government intervention (read textile parks) can shape up a logical growth in manufactured technical textiles sector?

An article on Odisha is particularly important due to the new found interest of textile and apparel manufacturing sector in that state and the recent spate of state sponsored meet to attract investors. We at TANTU have reached another important milestone in starting our website www.tantutextile.com hoping for better and dynamic engagement with industry.

Last but not the least I would like to thank our spouses and children for their support notwithstanding the agony and tolerance for all the late comings and meetings.

DR. PRABIR JANA
Editor-in-Chief

Smart textiles for Medical Protective Care

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In the early to end of 1990s, information technology was overheating. Companies in computer & mobile technologies in particular were well funded, sometime far over needs. The wearable technology scene was still fairly new and was may be a little over shadowed by the hotter, more talked about mobile gaming or Internet enterprises to catch the money train. The wearable community did naturally try to make it to the consumer market, but to succeed it would need a better application and a target market. There is a fine line between a smart textiles and wearable technology today.

The Philips & Levis ICDT Mooring Jacket was released in 2000 to a mixed reception. The jacket used a unified connector/controller to integrate a mobile phone, mini-disc player, ear phone & microphone. The electronic components were not fully integrated into the jacket, but were enclosed in pockets, with the wires held down using Velcro tabs. All of the components needed to be removed from the jacket for it to be washed. Another company, Scottevest, has developed a whole product line that utilizes a similar system of enclosures and pockets (Fig. 1). These jackets were not so successful commercially due to its high price. However, it provided a valuable insights for the smart clothes and wearing technology, highlighting problems of fully integrating clothing and electronics, washability & durability and also the complexity of the design and manufacturing such garment. Many of the wearable electronics were developed with more focus on advanced highly portable computing technology. In the past, large scale uptake of smart clothes and wearable technologies seems to have been inhibited by the lack of sufficiently advanced technologies. This would often lead to products not meeting the required needs and expectations of the potential users.

Dr. Arindam Basu

With time a number of developments have taken place in smart textiles (Wearable Electronics) area but despite that hardly any product has commercially been successful in India. Broadly these products can be classified into four categories as per the areas of usage such as Sports, Health care/ Medical, Fashion/ Entertainment and Military/ Public Sector.

NITRA has taken up a project, sponsored by the Ministry of Textiles, Government of India, to develop a product for old age people, army personnel and

Figure 1 - Representative wearable electronics

fire fighters. This product will fall in Health-care/ Medical categories and Military/ Public Sector categories. Generally old age caused various ailments and due to present society many times near & dear ones are not present with them all the time. When people in old age homes go for walk or move around through-out the day his/her condition can be monitored by the care taker of the old age home. If by any chance they go through sudden heart attack or some other serious problems the smart garment will send message to the care taker or the family members. Similarly military and border Security personnel move through risky areas. If by chance they are hit by bullet or other weapons his body temperature and heart beat will give the indication to the nearest camp and nearby moving partners. It is medically proven that if the patients in such cases are given medical care within 30-45 minutes a good number of lives can be saved.

The product is being designed at NITRA keeping the following points in mind.

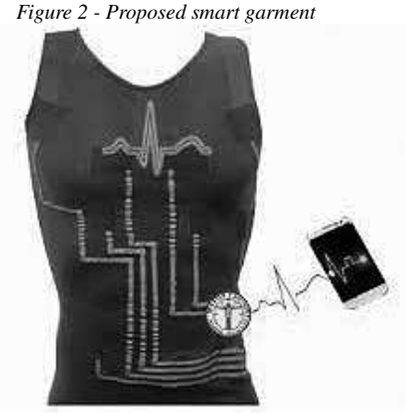
i. The apparel should be comfortable and washable
ii. The price of the product should not be too high, otherwise it will not be affordable.
iii. Along with measurement gadgets for different body parameters it should have GPS fixed in it so that the location of the wearer (in case of danger) becomes traceable.
iv. The sensors should not be affecting the comfort of the wearer.
v. With modern development of telecom area sensors should be linked with the mobile phone of the care takers. This will also avoid carrying any other gadgets by the care taker or the relatives.
vi. The finish of the fabric may include dust resistance & anti-microbial properties resulting in less washing or cleaning requirement.

The representative diagram of the proposed smart garment (Fig.2) is shown below.

The functions can be subdivided into few stages. The first part is sensing the vital body parameter such as temperature, pressure and heart beat. Though wrist bands are available commercially to measure the increment in heart beat/ pressure while walking or running these are not sensitive enough to take clinical/ medical decisions. Extra sensitive sensors have been sourced which will transform these parameters into measurable ones. This data need to be transmitted to the analyzer through conductive material.

The second part will accumulate and analyze the data received from the sensors. A software is being produced to analyze the data. Only when the data crosses the threshold limit the emergency switch will be on.

Figure 2 - Proposed smart garment



NITRA is planning to use open network to transmit the analysed data to the mobile phone/s of the care taker. If the threshold limit is reached the signal will be sent to the care taker/ relative. Otherwise it will become disturbance if the signals or charts are passed on to them continuously. The project work is moving in very fast speed and it is expected that a trial model of affordable, highly effective smart garment will be ready within six months from now.

Textile, Garment and Fashion Industry in Odisha: Prospects and Challenges

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After Agriculture, Textile and Clothing Industry is the second highest employer in India with 4% GDP, 14% of the country`s Industrial Production and avg.13.1 % of the country`s foreign exchange earner. This is the one of the oldest Industry in India and is mainly divided into (i) Handloom sector, (ii) Power loom sector (iii) Organised sectors. This Industry is in general suffering because of improper Govt policy, unskilled labours, higher labour cost in organised sectors, lack in vision and mission, old machineries, more power cost, hunger for quick return, etc. In the year 1982, the strike called by Dr. Datta Sawant crippled the Organised sectors. On the other hand, the decentralised sectors started booming. In the year 1968, the NTC was formed to save guard the employment of the Organised sectors but later on it became a burden on Ministry of Textile.

The state of Odisha in always a pioneer in Textile Sector mainly in Handloom and also in Handicraft. The Handloom Industry of Odisha is one of the oldest way to earn bread among the people. It is always remained famous in producing World famous products like “Katki saree”, “Sambalpuri Saree”, various silk sarees, Tassar Saree, Tie-dye, Bomkai Cotton, glossy khanduas, “Gamchas”, furnishing and Handicrafts.

But unfortunately, there are some shortfalls in growth of this industry in this viable state because of some policy matters, initiatives and foresight ness. This paper has highlighted a few of them.

Bibekananda Basu

Organised sectors in Odisha

There was only one Textile mill in Odisha name as Odisha Textile Mills at Choudwar of Mr. Biju Patnaik, from 1950 to 2001 and was closed down. There was another NTC Mills name as Odisha cotton mill at Bhagatpur established on sept `1946 and worked for 69 years and 11months and now closed. Industrial Development Corporation of Orissa Ltd(IDCOL) have set up

three Spinning mills as under so that the Handloom Weavers in Orissa can source quality yarn at reasonable prices. The three units were set up between 1981 to 1986.But due to management failure, corruption and so many other issues closed down one after another. Out of the 3 units,2 have been taken over by Sarda Group in Kolkatta and are being rerun by them.

- Sonepur Spinning Mils, Sonepur--and closed now.
- Baripada Spinning Mills, Baripada-Now being run by Sarda Group from 2007
- Aska Spinning Mills, Aska--Now being run by Sarda Group

Similarly, Director of Textiles, Govt of Orissa have set up Cooperative Spinning Mills as under,

- Orissa Weavers Cooperative Spinning Mills, Bargarh
- Utkal Weavers Co-op Spinning Mills, Denkanal
- Kalinga weaver's co-op Spinning Mills
- Gangpur Weavers Co-op Spinning mills

Gangpur(Near Rourkela) Taken Over by a Pvt Group in Kolkata and is being run as Ashoka Multiyarn ltd and is a profitable unit. Utkal is also taken by Ashoka Multi Yarn. The other 2 (Orissa Weavers Cooperative Spinning Mills, Bargarh and Kalinga weaver's co-op Spinning Mills) are closed now.

Handlooms and Textiles and Handicrafts Minister Snehangini Chhuria informed that all the six cooperative spinning mills of the State have been out of operation since long.The mills are the(1) Shree Jagannath Weavers' Cooperative Spinning Mill at Nuapatna in Cuttack district, the (2) Kalinga Weavers' Cooperative Spinning Mill at Gobindpur in Dhenkanal district, (3) Shree Gopinath Weavers' Cooperative Spinning Mill at Baliapal in Baleswar district, (4) the Utkal Weavers' Cooperative Spinning Mill at Mukundaprasad in Khordha district, (5) the Odisha Weavers' Cooperative Spinning Mill at Toral in Bargarh district and(6) Shree Sarala Weavers' Cooperative Spinning Mill at Tirtol in Jagatsinghpur.Chhuria said the liquidation process for the Shree Jagannath Weavers' Cooperative Spinning Mill was started on August 22, 2005. The causes of the closure of the Cooperative Spinning Mills are lack in initiative by State Govt, mismanagement, improper strategic planning, Mission & vision (as told by the Office of the Commissioner of Textiles).

The power loom Sectors at Odisha

Out of 25 lakhs power loom in India, the Odisha is having about 1793 installed power looms. The capacity utilisation is not 100%. Most of them run just in one shift of 8-12 hours' maximum. The table - 1 is highlighting the fact. (source: Ministry of Textile)

The reasons for such poor show are; (as told by power loom service centre)

- There is no big entrepreneur to run the show. No capital investment.
- If there is capital, there is no "knowhow", no proper support from top.
- There is no scope of getting sized beam nor any scope for wet processing.
- Although land, electricity, labours are available at cheaper rate, there is lack in initiative.
- No skilled labour is available.
- It requires fund, but although funds may be available, no one is coming forward.

About Power looms: (source: Nielsen, Ministry of Textile)

- Gamcha is the main product in these areas.
- All the looms are ordinary over pick looms. No auto loom is found,
- 95% yarns are cotton used in Gamcha. The cot-viscose is also used for Lungi.
- They take loan from the money lenders at High interest rate. Not much aware of "Pradhan Mantri Jandhan Yojona". Here they can take loan with interest of 9.54% up to 5 lakhs. But they are not much aware of that scheme although it was launched in 15th August 2014.

The local bodies such as

Table 1. Condition of Power Looms in Odisha

Place	**No of Looms**	**In Operation**	**Total workers Employed**	**Avg. Wages**	**Working Hours**	**Whether Registered**	**Yarn consumption (in lakh Kg)**		**Fabric Production (Lakh Mtr)**	
							2010-11	2011-12	2010-11	2011-12
Khurda	553	85%	1166	120-150/-	262 days, one shift / day	one / 305 in SSI	3.15 (cot-2.65, cot/vis-0.5)	5.8(cot-5.3, cot/vis-0.5)	68.9(only cotton Gamcha)	69.1(only cot gamcha)
Ganjam	435	90%	913(only 3 are women)	120-150/-	290 days,one shift /day	Yes in SSI	4.34	5.04	18.9	17.87
Dhenkanal	451	100%	971	120-150/-	265 days, one shift/ day	Except one in SSI	5.02	5.19	22.69	22.7
Cuttack	155	NA	338	120-150/-	308days, one shift / day of 10 hours	58 units in SSI and 3 in Dist Industries Centre	1.55(cot-1.05, Cot/vis-0.5)	1.85(cot-1.05, cot/vis-0.8)	3.6(cot, cot/vis)	4.5(cot, cot/vis)
Nayagarh	103	NA	201	100-150/-	271days, one shift/ day	Out of 56, 36 in SSI &1 in DIC	1.13	1.13	5.23	4.51
Puri	96	NA	203	120-150/-	311days, one shift /day	out of 58, 33 in SSI & 2 in DIC	72,150 KG	12,295kg	2.89	2.89
Total	1793		3788							

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Gramin Panchayets, BDO Etc. should come forward to help them in getting loan. It can be made popular through these Govt bodies. Bank requires small introduction. They can directly approach any Nationalised Bank(source: State Bank).

- Yarn price is an issue. Ministry of Textile has started "Yarn Bank" and Providing "Corpus Integrated Scheme for Power Loom Sector Development" (ISPSD) but as such the takers are very few (source: Ministry of Textile).
- No proper knowledge of Marketing.(massive support, Industrial Research are need of the hour)
- Lack of Skilled labour. ISDS has started by the Ministry of Textile, but this is a failure Project.
- No proper Quality Checking System. It requires skill guidance.
- They are not aware of TUF. TUF is not applicable for the Power Looms.
- No one is having ISO certifications.
- They do their own production or Job Work.
- They have implemented GIS. That benefits labours.

The Hand loom Sectors in Odisha

The Handloom Industry in Odisha is the largest cottage Industry providing employment and sustenance to 4 % of the population of the State. Right from producing superior artistic fabrics of excellence, this Industry also produces utility fabrics for the common masses at cheaper cost. However, in face of teething competition in open market, the strengthening of the Industry and its diversification is the continuous need for its survival is being provided by Govt. assistance in different forms. To achieve this end, different schemes have been formulated and are working under the Textile Directorate of the state. It is having 1.19 lakh number of looms in the state. Of which 88186 nos of looms have been brought under the cooperative fold and developmental activities are mostly being under taken in this organized sector under the directorate of Textiles.

During the 11th five-year plan commencing from the financial year of 2007-08 to 2011-2012, handloom cloth of 350.45 lakh square meters valued at Rs 21931.62 lakh were produced till the end of 2008-09, generating employment to 103264 weavers. (Handloom Development Corporation of India).There are 20 Handloom Clusters in India; and two out of them are in Odisha, Bargarh and Sonepur.

The Export of Handloomfrom Odisha: Export of handloom products was Rs.1253 crore (US$ 241 Million) during FY 2009-10 and witnessed a steady increase during the FYs 2010-11, 2011-12 and 2012-13 registering Rs.1575 crore (US$ 303 Million), Rs.2624 crore (US$ 505 Million) and Rs.2812 crore (US$ 521 Million) respectively. Subsequently export witnessed a decline during FY 2013-14 registering Rs.2233 crore (US$ 372 Million). However, export has marginally increased during FY 2014-15 reaching Rs.2246 crore (US$ 374 Million). (handloom export promotion council of India)

The Fashion Trend in Odisha: Western-style dress has gained greater acceptance in cities and towns among men, although the people prefer to wear traditional dresses like Dhoti, Kurtha and Gamucha during festivals or other religious occasions. Women normally prefer to wear the Saris (Sambalpuri Sari,Bomkai Sari, Kataki Sari) or the Shalwar kameez; western attire is becoming popular among younger women in cities and towns. The denims being used in large scale among the young generation but no manufacturer is found at Odisha.

The Garment Sectors at Odisha

There are several garment manufacturers are available (the exact fig, not available) mainly at Urban areas. Such as Parke Davis(Jeans), SN Garments (shirting), UNI source (ladies readymade), Krishna Kali (ladies

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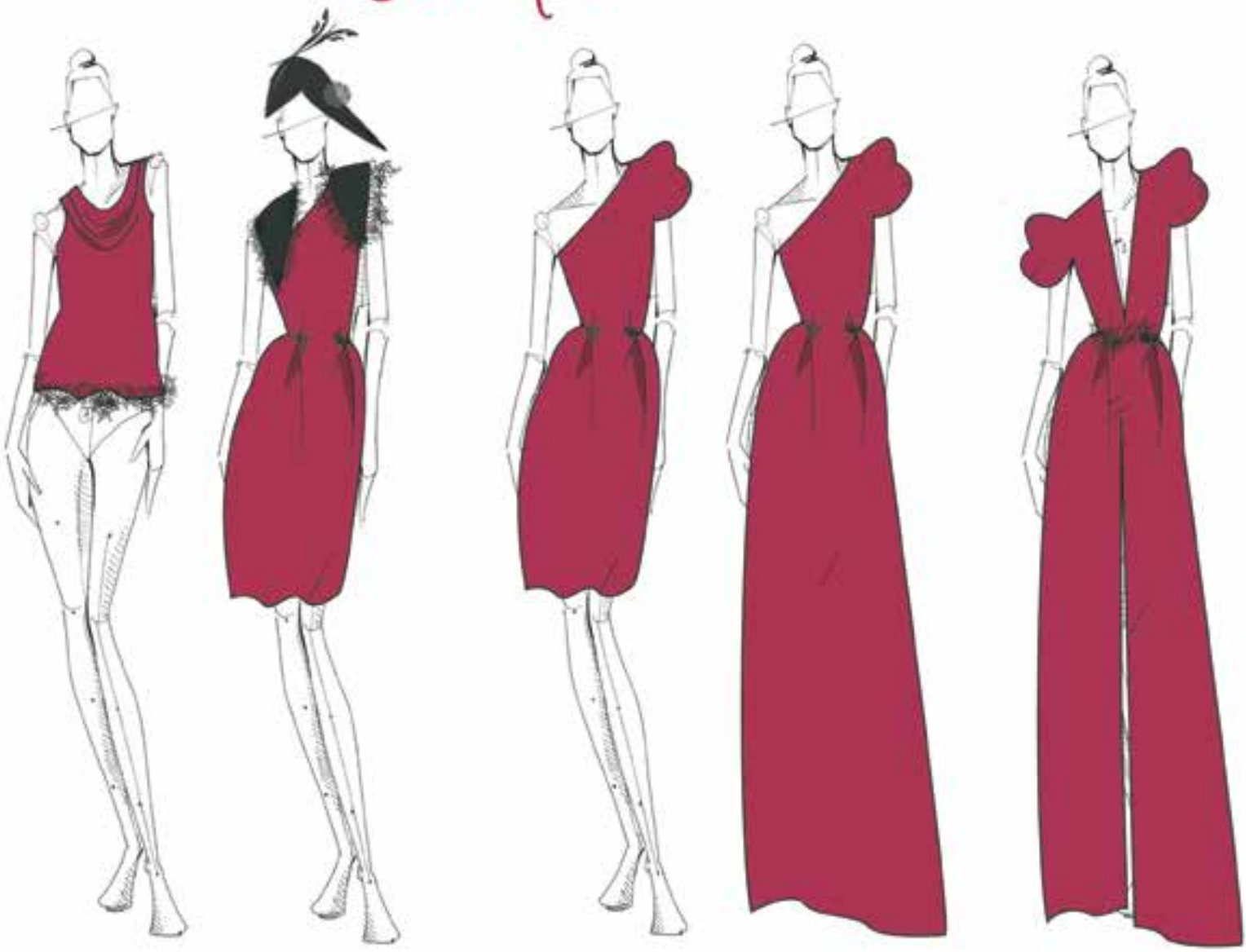

Manufacturer & Exporter of all of types of ladies garments.

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Important Handloom Centres in Odisha (Table -2)

Centers	Products name
Bargarh	Bed cover, dress materials, cotton tie & dye saree, silk saree, coarse cotton saree & others
Sonepur Boudh	Silk bomkai saree, tie & dye cotton saree, furnishing & silk tie & dye saree
Nuapatna	Silk khandua saree, caligraphy tassar saree & furnishing, coarse cotton saree & others.
Jagatsinghpur	Fine count cotton saree.
Kotpad	Vegetable dye saree & scarf, coarse cotton saree & others
Mayurbhanj, Gopalpur, Fakirpur, Mankidia	Tassar saree & furnishing, coarse cotton saree & others
Berhampur	Silk saree, coarse cotton saree & others
Kalahandi	Habaspuri saree, coarse cotton saree & others
Bolangir	Tie & dye cotton saree & furnishings, silk tie & dye saree, coarse cotton saree & others
Nayagarh, Puri, Gajapati, Rayagada, Nawarangpur, Nawapada, Malkangiri, Dhenkanal, Kendrapa, Bhadrak, Sundergarh, Sambalpur	Coarse cotton saree & others

embroidered readymade), EssBee Traders (Children readymade) and so on.

In Odisha, till now no Textile park has come up. The O/O The Commissioner of Textile says that it is State Govt who should provide Land, electricity, water etc. For every Project, MOT (Govt of India) provide Rs. 40 CR paid in 7 instalments. Much initiatives are to be taken by the states who should invite the entrepreneurs.Madura Fashion & Lifestyle (MFL), an Aditya Birla Groupenterprise, has proposed to set up a greenfield garment manufacturing unit in Odisha. It has sought 6-8 acres of developed land in Mancheswar industrial area in the city along with other incentive and concessions for putting up the facility.

MFL is the largest player in premium branded apparel segment known for brands like Allen Solly, Van Heusen,Louis Philippe and Peter England. The lifestyle player has lined up an investment of Rs 75 crore in three phases with an overall production capacity of 4.2 million pieces per annum for the Odisha unit.

Total manpower requirement is pegged at 4,600 in all the three phases. The company is keen to create 11 ancillary units around the proposed plant that include three washing units, three goods packaging units and five embroidery units. Madura has sought allotment of land at concessional rates, capital subsidy of 25 per cent on total investments made on the plant and an interest subsidy of five per cent on the overall investment.The company has requested full waiver on VAT (value added tax) and central sales tax (CST) for eight years from the date of commencement of operation. It has also sought full reimbursement on entry tax on plant and machinery and capital goods and raw material inputs for production of finished goods.

“We are keenly looking at establishing our base for manufacturing and selling from the state of Odisha and meet the requirement of northern India market in future and developing in a phased manner a strong manufacturing and warehousing hub for MFL. We believe Odisha as a state has great potential for us to establish and develop our business due to availability of labour, stable socio political environment, good infrastructure and defined

Table 3: The product range with manufacturing capacity in handloom sector.

(A) Silk tie-dye, Silk Bomkai & Cotton Bomkai Saree	Dist. - Boudh & Sonepur Blocks - 6 Looms - 6773 With a production potential of Rs. 4063.80 lakh
(B) Cotton tie-dye Saree and Furnishing	Dist. - Bargarh, Sonepur, Bolangir & Nuapada Blocks - 8 Looms - 8045 With a production potential of Rs. 3816.60 lakh
(C) Tasar thana Saree and Furnishing	Dist. - Bargarh, Jajpur, Balasore & Nuaptna Blocks - 3 Looms - 2424 With a production potential of Rs. 1163.52 lakh
(D) Khandua Silk Saree	Dist. - Cuttack Blocks - 2 Looms - 2255 With a production potential of Rs. 1217.70 lakh
(E) Berhampur Silk Saree Joda	Dist. - Ganjam Blocks - 1 Looms - 609 With a production potential of Rs. 292.32 lakh
(F) Single count Fine Cotton Saree (60s & above)	Dist. - Jagatsinghpur Blocks - 2 Looms - 2234 With a production potential of Rs. 804.24 lakh
(G) Medium Variety Cotton (40s to 60s)	Dist. - Jajpur, Khurda, Bargarh, Bolangir, Ganjam & Nayagarh Blocks - 10 Looms - 5563 With a production potential of Rs. 2003.47 lakh
(H) Coarse Variety Cotton (upto 40s)	Dist. - Bolangir, Cuttack, Khurda, Kendrapara, Nayagarh, Puri, Nuapara, Kalahandi, Kandhamal, Balasore, Bhadrak & Sambalpur, Sonepur Blocks - 36 Looms - 17220 With a production potential of Rs. 5166.00 lakh

political and economic support for the growth of the industry in the state," the company said in its proposal to the state government."Since this will be our first project in the state and being one of the early movers in setting up greenfield apparel garmenting unit, we are seeking active support from the state government towards infrastructure and incentives to make our investment attractive and financially viable," it added.In the first phase, MFL will pump in Rs 40 crore on the project to create a production capacity of two million pieces. The plant, in the first phase, is poised to generate sales of Rs 250 crore for the company.

The State Govt Initiative

The following special package for weavers/artisans and sericulture farmers for the state was announced by Hon'ble Chief Minister on 8th January, 2013.

- 20 nos. of Handloom/ Handicrafts clusters will be developed.
- Premium assistance to weavers and artisans for enrolment under Insurance Scheme.
- Supply of Solar Lantern to weaver and artisan families.
- Supply of utility items like gumboot, torch light, umbrella and secateurs etc. to tassar farmers.
- Provision of Work shed-Cum-Housing to all

deserving poor weavers and artisans under “Mo Kudia” Yojana.

- Provision of Old age pension to all eligible weavers and artisans under “Madhubabu Pension Scheme”. Creation of welfare fund with an initial corpus provision of Rs.50.00 lakh for sericulture farmers.
- Creation of welfare fund with an initial corpus provision of Rs.50.00 lakh for handicraft artisans.

Possibilities and Potentialities in Developing Odisha Textile Industries in more Profitable Zone.
(Expert view)

- The fashion trend to be made much more lucrative and profit making.
- The fashion is being inspired by myself seeing others beauty. (Film stars or any one)
- The Fashion is some mental requirements, match with social life, working style, day to day life.
- The fashion trend is what the mass especially the young generation are expecting! They want comfort, smart look, and satisfaction in his/her dress.
- If satisfied, it will bring positivity among them, bring good thought, increase abilities and then drive him in to fashion.
- The heritage value (handi works, batik print etc., tie dye) has some international market value.
- To start with E-Market, prepare web base, take the varieties of designs from different fashion designers, get it selected by voting method (gradation 1-10), then that mass accepted design can be manufacturing and can be marketed by renowned manufacturers say pantaloons, Aditya Birla group etc.
- From the conventional “gamcha” the application areas can be changed to garments, night dress, shorts, sportswear etc. The manufacturing cost being low in Odisha, the same can be sold to other states by the brand name manufacturers or by the state govt.
- Kantha stitch is a popular brand in Odisha and so many ladies are expert in doing it. They can be utilised and employment generation can be done.
- The Boyonika, weaver’s cooperatives, NIFT etc can have enough R&D in these aspects, can take opinions from the experts and to see that the Organisations run in profit.
- No blame game should be entertained.

Acknowledgements

Dr. Siba Mishra, Director KIIT University, Bhubaneshwar and President Textile Association, Odisha Unit, Mr. P.C.Basu , D.Daschoudhury , Director and Asstistant Directors of the Office of the Commissioner of Textile, Mumbai for their full-fledged support with feedback.

Technical Textiles: The Theme to Reshape Indian Textile Industry in a Progression Mode

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Introduction

Development of Science &Technology has led to the growth of industry, employment generation and Socio-Economic development of any country across the globe since last few decades. This has facilitated R&D initiative, Product development and Innovation including infusion of new ideas etc. in manufacturing sector in the recent decades. Technical Textile is an area, emerged in the world of textiles as a new innovation in the early years of 1900's with the invention of special variety man-made fibers. The diverse uses of technical textiles have opened up a new vista to infuse innovative ideas; simultaneously R&D initiatives have been made to develop new generation textiles by using special characteristics materials & innovative technology. Indian textile industry has made a humble beginning in and around late 70's to start manufacturing technical textiles mainly in the area of Filter fabrics and Geo-textiles. India has been a pioneer of manufacturing Surgical cotton and bandages since the ancient times by using traditional knowledge acquired during that period, though it was never been recognized as Technical Textiles at that point. However; with the passage of time, technical textiles have been widely categorized based on the end uses and the products (Bandage& surgical cotton) have been included as Medical Textiles. With the advent of new technology & developmental works undertaken in various spheres,


Chandan Saha

technical textile has got an importance in daily life due to diverse uses. Popularity of technical textile has grown up widely and there is a huge surge in demand mostly in the developed countries. The global technical textile market is estimated to be US$104bn in 2010 and it has grown up to US$148.5bn in 2014 and expected to grow @ 4.5% from 2015-2020. The technical textile market size is projected to reach 42.20Mn tons by 2020. The market for the global technical textile

industry has witnessed an upward surge since 2000. It is reported that share of Asia Pacific region is around 33.13% followed by North America and European region29.13% and 24.02% respectively. The working group report projected in 12th plan that the market size of India is expected to reach US$29bn (approx) by 2016-17 on year to year growth rate of 20% during 12th plan. Experts opine that technical textile market was estimated at US$ 14bnin 2010 and it is likely to reachUS$32bn by 2023. It is stated that domestic consumption of technical textile is only 3% of Global technical textile a couple of years back, though there is a huge opportunity to enlarge the area of application. At present, consumption of technical textiles is mostly confined in the area of transport sector, health care, industry and geo textile etc. It is stated that new areas have been identified for technical textiles under the major segments which need a lot of R&D initiatives and innovation to make the products affordable. However, consumption of technical textile shows an upward trend in the recent years as developmental works have been undertaken in the area of Infrastructure, Construction, healthcare and Protective & Safety etc. The opportunities are emerged in a big way with the rapid change of life style, enhanced income & expenditure and health & hygiene consciousness in society. The opportunities need to be tapped with an in-depth vision. This will lead to the growth of industry and also enable to sustain in long term.

Status, Opportunities and Emerging Challenges to Indian Textile industry

Indian textile industry historically has been playing a pivotal role in improving Indian socio- economic structure and contributing significantly since pre-independence era. The sector had got a big success in many areas which made the Indian economy strong. It had been the one of the largest forex earning industry in the country till 2000 and the industry has been registering an exponential growth since mid 80's. With the advent of WTO, the market economy has been opened up phase wise to comply with the global trade practices with the business partner/ trade block countries. This has brought a set back to the industries at the beginning, as domestic manufacturers were not enough capable to withstand the emerging challenges ushered in the new era. India has been experiencing a stiff competition from neighbouring countries slowly with the abolition of quota regime. Besides, technology has made a big hurdle for industries to make an in-road in the global market, taking an edge on the small countries, who have made a big dent in the market. India had been exporting textile & clothing items mainly based on the quota allotted to us. Besides this, export of various items has also been made outside quota countries in 90's onwards. India's export basket was full of traditional items of low value added product. It has been reported on various occasions that India had been incapable of full utilization of quota in various categories. Unfortunately, we had never learnt any lesson from all sufferings instead we had been advocating for some incentive/ subsidies to compete. It was never being an appropriate proposition as these short term measures never benefit any industry for long rather, it had invited a disaster to the industries. Indian textile industries had made serious attempts to recover from the crisis but it really didn't yield much encouraging results to inspire. Domestic industries were not very keen to come out of traditional manufacturing practices and were not much serious to venture in high risk areas as domestic market is growing rapidly in the last one decade. Union Govt. had launched several plan schemes, providing various assistance/incentives to encourage industries to step up their initiatives to venture in manufacturing high value added products. This had facilitated the established manufacturers and new generation manufacturers

to move to high risk areas, leaving behind the concept of manufacturing traditional items. But the progress is very slow and there is no visible impact as on date.

Growth of Technical textile Industry – The Way to move forward

India has been witnessing huge innovation in various fields like technology, Product, Trade etc. in the last one & half decade. Technical textile is one such innovation come in the market with a huge expectation of growth and diversification in manufacturing activity. Technical textiles are special variety of products used primarily for their technical performance and functional properties rather than their aesthetic or decorative characteristics. Technical textile industry is a knowledge based research oriented industry and has been steadily gaining ground due to its functional characteristics and its suitability in diverse uses. The main users of technical textiles are the industries like Automobile, Healthcare, Medical, Sports, Railways, Protective/ Safety and Infrastructure & Construction etc. The global technical textile consumption is stood at 23Mn MT in 2010 at a compound growth rate of 3% since 2007. Technical textile industry is still in nascent stage in comparison to developed countries. India has made a humble beginning in the early 70's but progress was very slow. As per information available there are around 600 odd units established throughout the country, involved in manufacturing wide range of technical textiles. Though India is the second largest textile economy in the world after China, but it's contribution in global technical textile industry is comparatively is very less. The global consumption of technical textile is in USA, Western Europe and Japan which accounts for 65% of the world consumption. It is reported in the recent study report that China has made a good progress by enhancing it's consumption to 15% whereas; India accounts for only 8.6% of the total consumption. India's technical textile market is mainly confined in the area of Packtech, Clothtech and Hometech etc. Though India has made serious initiatives in the area of Geo textile and Industry textile and later on Sport tech but consumption pattern was not much encouraging in the domestic market. Industry has also not progressed much in the last few decades as there was no indigenous technology available to produce flawless long length fabrics conforming to the specifications of specific end uses. Indian industry has been using imported technology mostly from Europe and USA. Besides this, non-availability of raw material in the domestic market was another challenge to the industry. Materials were mostly imported to produce products. At present, availability of technology and raw materials is more convenient to undertake such activity. At present technical textiles industries are mostly confined in medium and small scale sector and industries are established in Maharashtra, Gujarat, MP and NCR etc. Manufacturing activity is mainly confined in the area of Industry textiles, Geo-textiles and medical textiles etc. Domestic industries couldn't move much advance in absence of appropriate forecast on market demand though it could be an investment friendly industry and there could be a huge opportunity for FDI. Unfortunately, it got failed to articulate any big investor except in the selected fields where manufacturer's presence were already in place. There is no doubt, a few manufacturers from the developed countries are showing their inclination to establish manufacturing centers in India after Govt. has made new policy formulation comprises of implementing various plan schemes and FDI. Union Govt. has initiated an effort to undertake baseline survey by competent institute to have appropriate inputs on technical textiles. This will enable the Govt. to frame a roadmap to focus on the

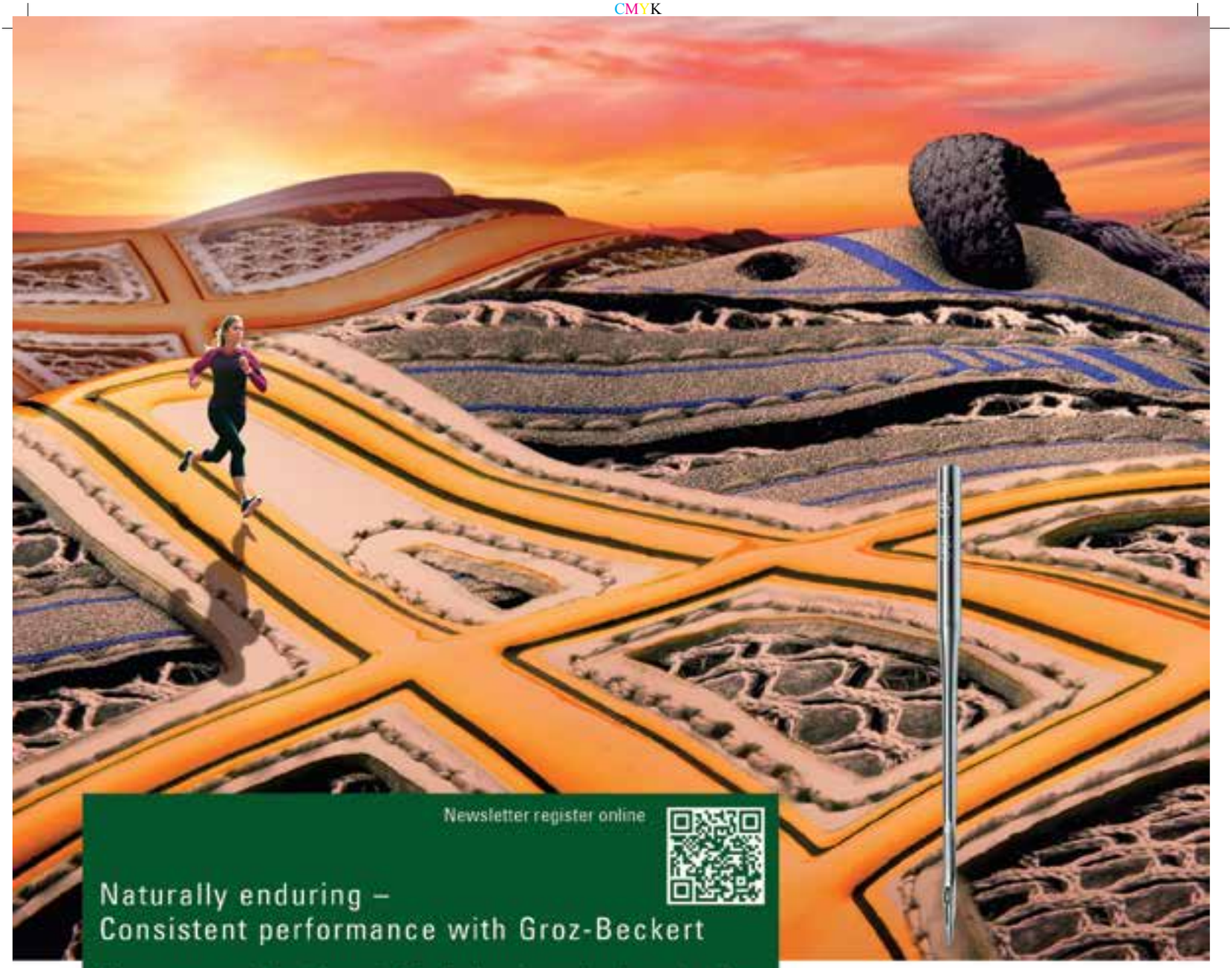
specific sector. This will also place the concerned institutes in appropriate position to undertake R&D initiatives and encourage innovation to achieve desired results.

It is reported that currently technical textile market is estimated at US$14bn and it is expected to reach US$32bn by 2023. Technical textile industry will grow at the rate of 20% during the 12th plan and projected market size is Rs.158540crores. Indian Meditech is expected to grow at the rate of 20% to US$1039Mn by 2016-17. Similarly, Mobiltech is expected to grow at the rate of 17% to US$1870Mn, Industry textile is expected to grow at the rate of 18% to US$ 2034 Mn and both Geo textile and Packaging textile will grow at the rate of 22% to US$201Mn and US$11782mn during the same period. Non woven textile has got a major share in technical textile across the globe. Surely; there will be no exception in India. Experts opine that Non woven technical textile has specific uses in Oil and allied industry where minute particles of undesirables have to be removed in absolute terms and demand for such product in the industry is quite substantial. Opportunity to grow such industries is huge in the coming days. It is stated that the cost advantage is higher for India for various high end technical textiles product as compared to US and Europe which have the advantage of large economies of scale. But the various constraints like low scale of production, higher fixed cost per unit, shortage/non availability of specific quality materials in India have put in a disadvantageous position. However, Union Govt. Ministry of Textile has realized the compulsions and introduced various schemes/ widening the scope of existing schemes to extend support to grow the sector to cater the needs of domestic consumers. It is expected that the initiatives made by the Govt. will articulate the new generation entrepreneurs to make venture in this area thus boosting manufacturing activity at a new scale. This will surely strengthen the Indian textile industry as a whole and it will facilitate the industry to retain its importance in the Global market in the coming year.

Initiatives made by the Union Govt. to Promote the Sector.

Technical textile is a high technology & sunrise sector and the sector is steadily gaining ground in India. Technical textile products derive their demand from development and industrialization in a country. The market for technical textile can only be expected to grow in tandem with industrial growth in different parts of the world. Technical textile is in nascent stage in India though it has made a good beginning in late70's but it could not augur well with the passage of time. The huge opportunity has been identified but the potential has been remained untapped. Union Govt. has made a good no. of initiatives to promote the sector. A good no. of Plan schemes have been launched during the 11th& 12th plan to encourage the manufacturers to make a venture in this segment. Various awareness programmes have been conducted by the concerned ministry and institutions to enhance outreach the users. Around eight Center of Excellence have been established at various corners of the country.

Technical textile unit can avail several benefits from central plan schemes like Technology Up-gradation Fund (TUF), Scheme for Integrated Textile Park (SITP), Coverage of major machinery for Technical textile manufacturing under concessional customs duty of 5%, Selected technical textile products are covered under Focus Product scheme, under which exports of such products carry duty credit scrip equivalent to 2% of FOB value of exports. Besides these, separate Scheme for Promoting usage of Agro-Textile and Geo-Technical textile in NER states etc. Additionally several states in the country offer various incentives and assistance to investors which includes, Electricity and Stamp duty exemption, concessions in land registration and Single



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Window clearing facilities to set up industries etc. Eight Centers of Excellency have been established to undertake research activities to develop technical textiles in various fields.

Summing-up

Technical textile though is in incipient stage in India but growth rate in the last decade indicates a good progress. This has been identified as Hi-tech and sunrise industry in the country. Per capita consumption is still meager in comparison to developed and world average per capita consumption. There is a huge developmental activity undertaken by the Govt. during the 11th & 12th plan and it is expected that demand of various technical textiles will grow substantially in the category of Geo textile, Health care textile products, Automobile and Packtech etc.

It is reported that Technical textile has registered a compound annual rate of growth of 11% during the 11th plan and estimated compound annual rate of growth of 20% during the 12th plan. Market size may reach Rs.1,58,540crores by 2016-17 from a market size of Rs.70,151 crores. Market size is estimated at Rs. 1,31,836 crores in the year 2015-16. Despite of achieving a substantial growth rate still per capita consumption of Technical textiles in India is only 1.7kg vis a vis 10-12 kg in developed countries. Globally technical textile contributes around 27% of textile industry, Western countries contribute around 50%, whereas India's contribution is only 11% of total production. This indicates the huge potential of technical textile industry's growth opportunity in the next decades. Once the technical textile industry moves in a growth path, market size will automatically expand. Export of textile will surge in terms of value and share in the global market. This will bring an opportunity to Indian textile industry to consolidate its position in the world market narrowing the gap with other leaders. Indian textile industry has to frame an appropriate roadmap to reshape its structure with an appropriate investment plan to build capacity and competence to develop innovative products to cater the needs of developed countries consumers as well as growing demand of domestic consumers. The captains of the industry have to make serious attempts to frame investment plan right from fiber to finished product to boost the manufacturing activity to reap the benefit in future. Indian textile industry has to carry forward the idea that technical textile is the ultimate option to reshape the industry to make its presence visible in the global market with valued contribution.

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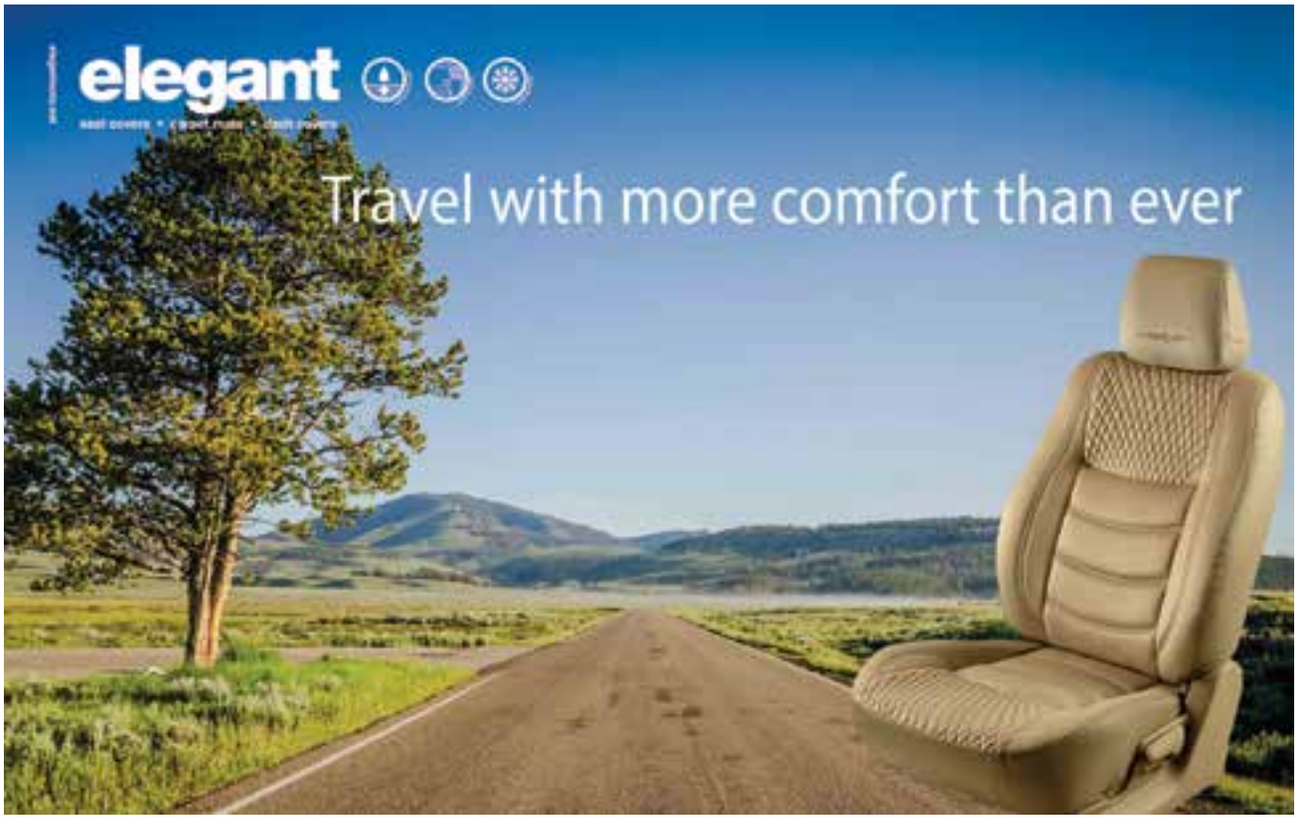

Design & Development of High Performance Active Smart Sportswear

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Introduction

Sportswear is not just used by athletes while performing, but is becoming a major part of everyday clothing during morning walks, jogging, yoga, stretching exercises and daily fitness activities because of quality comfort of sports clothing. As per market demand, sportswear are categorized in to four groups, viz performance sportswear, basic sportswear, sports leisurewear & sports –fashion clothing. Performance sportswear is highly technical-oriented clothing which enhances the performance with special functionality. it is produced in lowest volume and highest price range ,whereas basic sportswear is cheaper and more stylish while retaining as many of the material attributes as possible, sports leisurewear is replica of the performance sportswear, worn at home and is sold in higher volume at much smaller price. Functional requirements of performance sportswear depends on nature of sport, climatic conditions and amount of physical activity. high active sports are classified as one which is being played for short duration of time with maximum physical activity like tennis, soccer, basketball, volleyball, running ,jumping etc wear comfort of active wear may affect by performance of players [1]

Requirement of active sportswear

Functional Properties

- Active sportswear requires super lightweight, low fluid resistance, super high tenacity and stretch ability.
- Critical features include thermal retention, UV resistance, cooling capacity, sweat absorption and fast drying,
- Vapour permeability, water proofing to provide relaxation without fatigue as cited below in figure 1.

K.N Chatterjee

Aesthetic properties

- Sensitivity of softness, surface texture, handle, luster, colour variation, transparency and comfort

in sports wear are important factors.

- Protection: From wind water and adverse weather
- Insulation: Protection from cold
- Vapour Permeability: To ensure that body vapour passes outward through all layers of the clothing system.
- Stretch: To provide the freedom of movement necessary in sports[1-2]

The term "Smart Textiles" refers to a broad field of studies and products that extend the functionality and usefulness of common fabrics. Smart Textiles are defined as textile products such as fibers and filaments, yarns together with woven, knitted or non-woven structures, which can interact with the environment/ user. Smart Textiles present a challenge in several fields such as the medical, sport, and artistic communities, the military and aerospace. This review paper mainly focuses designing concept for high performance active smart sportswear.

Today, there is a keen interest of researchers and industrialists in the field of smart and wearable sensors has caused the work done in this area to gain a lot of importance in the last few decades.

Sensors for monitoring physiological parameters, such as the body temperature, heart rate, electrocardiogram as well as sweat rate measuring sensors have been in the focus of research. The development of such sensor systems includes many requirements to consider such as costs, size and weight limitations.

Presently much research has been conducted by NASA in the field of high performance protective textiles for protecting astronauts and monitoring their health.

Nike and Adidas dominate the market with their aggressive branding strategies, including technology branding. However, while these giants account for approx. 50% of turnover for sports products, the rest of the industry is characterised by many small manufacturers whose proximity to the customer and understanding of consumer's functional needs and wishes are the key factors behind their success.

High volume production of sports clothing and low technology products are generally undertaken in Asia, India and Eastern Europe, a new market for specific products for dedicated uses such as running, skiing and specific sports has created a niche market where European manufacturers are able to compete with flexible small series production of specialised products. The concept here is to develop and launch comfortable,

Figure 1 - Functional requirement: Sweat absorption, fast drying, cooling, high tenacity, stretch ability.

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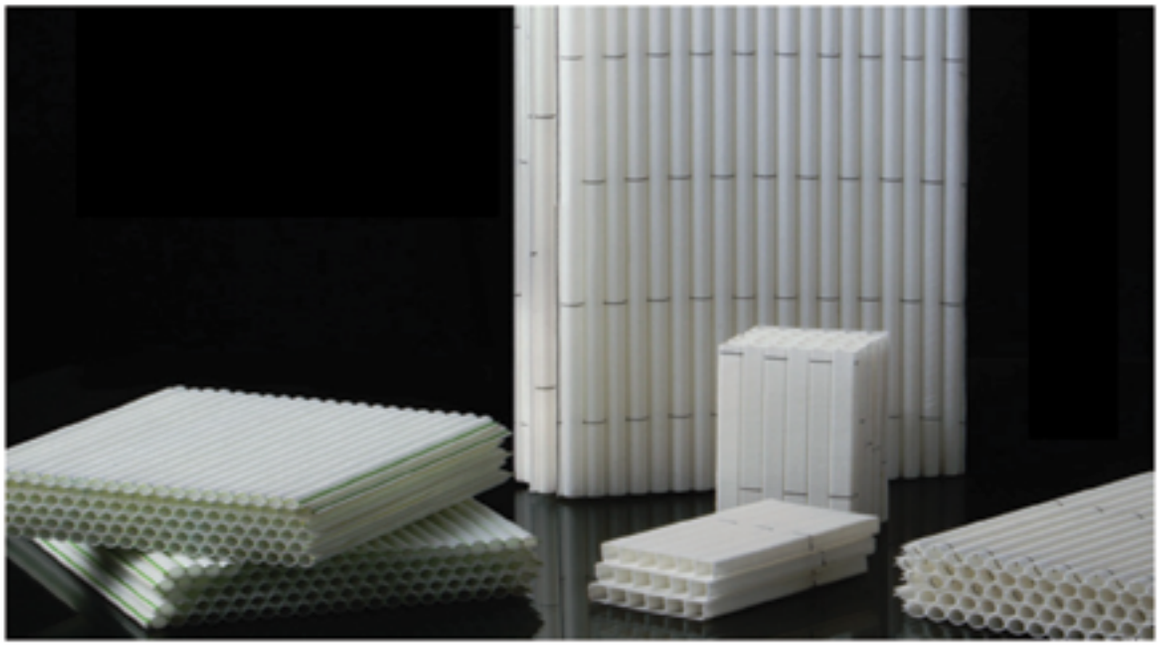

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high performance, protective sportswear facilitating tracing the exact location of the players along with continuous monitoring of players health. Such a development would be highly appreciable and will lead to new sportswear for various sports.

Designing steps for high performance active smart sportswear:-

- Selection of Raw materials(fibrous materials)
- Development of high performance fabrics.
- Development of printed control circuit board embedded with light weight sensors
- like heart beat measuring, temperature measuring sensors.
- Attachment/integration of board with sportswear.

Selection of fibrous material

Selection of fibres or fabrics for manufacturing active sportswear is one big factor influencing performance, efficiency, ensuring protection, and physical comfort. For every active sport, synthetic fibres & specialized synthetic fibres are preferred because they do not retain moisture and therefore do not get heavy upon sweating like natural fibres. Synthetic sports uniforms have better dimensional stability. Synthetic fibres offer the three major requirements in today's high technology sports uniforms. Warmth, wind resistance, moisture management, wicking and lightness. Comfort and feel of natural fibres Style and variety of colours. They can have either hydrophilic (wetting) surfaces or hydrophobic (non- wetting) surfaces. They are generally considered to be the best choice for sportswear as they are able to provide a good combination of moisture management, softness, lightweight, insulation and quick drying. It is generally agreed that fabrics with moisture wicking properties can regulate body temperature, improve muscle performance and delay exhaust[2].

Types of fibres used in sportswear

Synthetic fibres

Polyester: Polyester has outstanding dimensional stability and offer excellent resistance to dirt, alkalies, decay, mold and most common organic solvents. Excellent heat resistance or thermal stability is also an attribute of polyester. It is the fibre used most commonly in base fabrics for active wear because of its low moisture absorption, easy care properties and low cost. Polyester is essentially hydrophobic and does not absorb moisture. However, most polyester used in base layer clothing is chemically treated so that they are able to wick moisture.

Polyamide

Polyamide fibres such as nylon 6 and nylon 6.6 have higher moisture absorption rates and

better wicking ability than polyesters but dry more slowly. It has high strength and exceptionally strong fibre used for swimwear and cycling clothing or as reinforcing fibre in blends used for sports socks.

Polypropylene

Polypropylene fibres have very low moisture absorbency but excellent wicking ability. It has

good moisture management property due to its hydrophobic nature as polypropylene does not wet out, its thermal insulation is retained during and after strenuous activity which keeping the wearer warm in cold weather and cold in warm weather.

Elastomeric fibres

These fibres are frequently used in small quantities in garments to increase stretch and support. For example knitted sportswear contains 3-10 per cent of Elastomeric fibres. It will not affect the Thermo-physiological comfort of garments that contain them.

- Natural fibres

Cotton

Cotton garments provide a good combination of softness and comfort. However, cotton is not recommended for use

in base layer clothing because of its tendency to absorb and retain moisture. When cotton becomes wet, it dries out slowly. This can lead to rapid and undesired heat loss once activity has stopped. However, cotton fabrics are easier to clean than those based on many synthetic fibres.

Wool

Wool has good wicking ability and is a good insulator even when wet. However, wool is slow to dry and has a high wet surface coefficient of friction. It also has higher heat releasing and heat absorption properties accompanying moisture absorption and desorption respectively, which strengthens the buffering effect of the clothing between the human body and the surrounding environment.

Silk

Silk has good wicking ability and it breaths well because of its hollow structure. Silk also has high thermal conductivity and therefore feels cool to the touch. Silk is not, however, an easy fibre to care for, which is a disadvantage in sportswear that is worn frequently.

► Specialised synthetic fibres

Synthetic fibre can be modified during manufacture to improve its thermo physiological and sensory properties. A number of different techniques are available for producing such fibres, including the following:

- Block copolymers can be added to the base polymer before extrusion
- Fibres can be extruded with different cross sections.
- Fibres can be coated after treatment

Micro fibres

One of the most common modifications made in order to provide improved comfort is the use of superfine fibres or microfibres with the filaments having a linear density well below 1 decitex. The use of these fibres enables very dense fabrics to be created in which the fibre surface is significantly increased and the space between the fibres is reduced. This leads to the increase of capillary action for better thermal regulation. Microfibre exhibits better moisture transport and ensures better moisture control. Microfibres have higher breathability and moisture transport properties and because they are wind- and water proof, these fabrics are widely used in rainwear and active sportswear. Specialised polyester fibres (Modified polyester) have been developed in order to produce a more natural handle, to increase absorbency, to provide better thermal resistance and to reduce static charges.

Hygra

Unitika Limited has launched Hygra which is a sheath core type filament yarn composed of fibre made from water absorbing polymer and nylon. The water-absorbing polymer has a special network structure that absorbs 35 times its own weight of water and offers quick releasing properties that the conventional water absorbing polymer cannot do. On the other hand, nylon in the core gives tensile strength and dimensional stability. Hygra also has superior antistatic properties even under low wet conditions. The main apparel applications include sportswear like athletic wear, skiwear, and golf wear etc.

Dryarn

Dryarn is a completely recyclable polypropylene micro-fibre. Fabric from Dryarn is very lightweight and comfortable and used in different sports. In addition, it has a soft handle and a high thermoregulatory capacity and also dries quickly. Bacteria cannot settle on smooth surface of the fibre which avoids unpleasant odour associated with decomposition of bacteria.

Killat N

Killat N from Kanebo Ltd is a nylon hollow filament. The hollow portion is about 33 per cent of the cross section of each filament due to which it gives good water absorbency and warmth retentive property. The manufacturing technology of Killat N is very interesting.

The yarn is spun as bi-component filament yarn with soluble polyester copolymer as the core portion and nylon as the skin portion. Then by giving alkali weight loss treatment the soluble polyester copolymer of the bi-component filament will dissolve and large hollow portion (exceeding 30 per cent of the cross section) will be created.

Triactor

Toyoba Co Ltd has developed Triactor, which is a perspiration absorbing/quick drying polyester filament. Polyester is hydrophobic and does not absorb moisture but by changing the filaments to Y shaped cross section causes quick perspiration absorbency by capillary action. The hydrophobic nature and large filament surface of polyester filaments realise quick drying and refreshing properties at the same time.

Coolmax

Coolmax is a four-channel modified polyester fibre with a crosssection that resembles a double scallop. It offers improved wicking capability and moisture vapour permeability. It dries significantly more quickly than many other fabrics used in sportswear.

Hydrofilia (Modified polyamides)

Hydrofiliais a polyamide block copolymer containing 85 per cent nylon 6 and 15% polyethylene oxide diamine which provides significantly improved water absorbency, up to the levels associated with cellulosic fibres. Polyamide microfibres such as Tactel Micro, Microfine, Supplex and Microfibre, are used in fabric to produce superior wind protection, a soft feel and good moisture vapour transmission.

- Regenerated fibres for Sportswear

Tencel

Tencel is the generic name of Lyocell. Lyocell is a natural, manmade fibre produced in an environmentfriendly process from wood pulp that has become popular in clothing. The moisture management of tencel is unique when compared to synthetic fibres and allows for peak performances in sports. The excellent moisture absorption is perfect for the skin and thus guarantees well being at a very high level.

Bamboo

Bamboo fabrics are made from pure bamboo fibre yarns which have excellent wet permeability, moisture vapour transmission property, soft hand, better drape, easy dyeing,splendid colours. It is newly founded, great prospective green fabric. Bamboo fibre has a unique function of anti bacteria, which is suitable to make underwear, tight t- shirt and socks. Its anti – ultraviolet nature is suitable to make summer clothing.

Soybean

soybean protein contained in the fibre remakes a superior, soft hand endowed with both moisture absorbency and permeability, which makes best application in knits and innerwear. Finishes with an antibacterial agent, health-care functionalities are also given. It has great potential in its use in high-grade knits and innerwear.

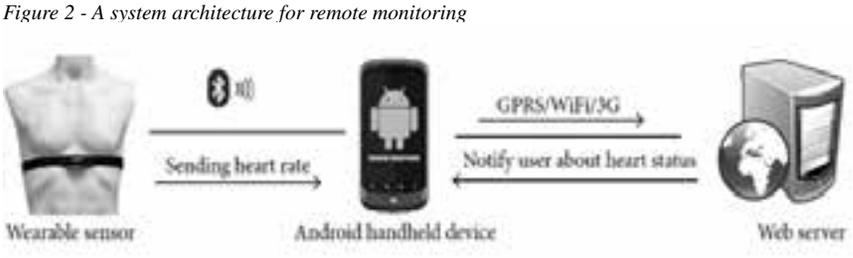
Wearable technology

A conceptual representation of a system for remote monitoring is shown in Figure 2. Wearable sensors are used to gather physiological and movement data thus enabling patient's status monitoring. Sensors are deployed according to the clinical application of interest. Sensors to monitor vital signs (e.g. heart rate and respiratory rate) would be deployed, for instance, when monitoring patients with congestive heart failure or patients with chronic.

Wearable systems for person' remote monitoring consist of three main building blocks:

- The sensing and data collection hardware to collect physiological and movement data,
- The communication hardware and software to relay data to a remote center, and
- The data analysis

Figure 2 - A system architecture for remote monitoring



techniques to extract clinically-relevant information from physiological and movement data.

Recent advances in sensor technology, microelectronics, telecommunication, and data analysis techniques have enabled the development and deployment of wearable systems for person' remote monitoring. The miniaturization of sensors and electronic circuits based on the use of microelectronics has played a key role in the development of wearable systems. One of the major hurdles to the adoption of sensing technology, especially for wearable applications, has been the size of the sensors and front-end electronics that, in the past, made the hardware to gather physiological and movement data too obtrusive to be suitable for long-term monitoring applications. Recent developments in the field of microelectronics have allowed researchers to develop miniature circuits entailing sensing capability, front-end amplification, microcontroller functions, and radio transmission. The flexible circuit shown in Figure 3 is an example of such technology and allows one to gather physiological data as well as transmit the data wirelessly to a data logger using a low-power radio.

Health monitoring applications of wearable systems most often employ multiple sensors that are typically integrated into a sensor network either limited to body worn sensors or integrating body-worn sensors and ambient sensors. In the early days of body-worn sensor networks (often referred to as "body sensor networks"), the integration of wearable sensors was achieved by running "wires" in pockets created in garments for this purpose to connect body-worn sensors. An example of this technology is the MI Thril system. Such systems by design were not suitable for long-term health monitoring.

Figure 3 - illustration of Flexible wireless ECG sensor with a fully functional microcontroller[6]

Recently developed wearable systems integrate individual sensors into the sensor network by relying on modern wireless communication technology.

An alternative to inbuilt smart phone sensors is wearable sensors that have been used for continuous monitoring, storing, and sending medical data to healthcare givers over distance. Existing studies with wearable sensors offer monitoring in applications like physiological, biochemical, and motion sensing These sensors have been used in monitoring health indicators and body positions of the patients, as well as in keeping track of sports and other activities. These wearable sensors are becoming promising due to the fact that these sensors are low cost, easily available, user friendly, accurate, and reliable. Wearable technology is also useful in solving the issues of monitoring in motion artifacts by using multiple sensors integrated on a single chip. Integration of different sensors on same platform (tight fitting in garment) in order to monitor respiratory diseases is another kind of application. [3-6]

Advantages of active smart sportswear

- New developed sportswear will be embedded with sensors, which can be traced by GPS receiver. The exact location of

sports person can be traced case of paragliding, skiing, mountain, car racing etc.

- Sportswear will be fitted with lightweight sensors, to measure body temperature, sweating rate continuously.
- Durable enough and machine-washable.

The trainer or coach can manage the amount of training, checking the player's health condition, before a health problem occurs.

Conclusion

The sportswear manufacturing textile industries not only keep their eyes on market diversification for fibrous materials but also on textile science and technology.
The use of innovative textile science and technology (e.g wearable technology) in the manufacturing of sports and leisurewear fabrics is continuously enhancing day by day to fulfill the requirements for athletics and leisure activities for their better performance in the sports. The performance requirements of many sports goods often demand widely on different properties. Recording and comparing multiple data sets of sports performance allows evaluation of training processes and planning of further sessions. However, on the way to fully implement sensor systems into training routines, some more research has to be done in order to yield results, which are easy to interpret by the athlete. The presented sensor system can help to improve research by gaining relevant data without complex and expensive laboratory trials. In order to allow real time monitoring, the integration of a wireless data transmission module is a logical.

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Readymade Garment Manufacturing - an Overview

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When wego for shopping clothes in the local market or in malls,we find garment shops are everywhere. All shops are filled with thousands of garment pieces with variety of product categories and product designs. All these readymade garments are made in garment factories in different parts of our country. Even many readymade garments are imported from other countries like China and Bangladesh. Most of thesebranded garments are made in industrial production environment.

Let me share the steps and explain it how our garments are made in factories. Industrial production system is followed in manufacturing readymade garments. I will show you all the processes involvedin industrial production of readymade garments from the point when fabrics are sourced at the factory to retail-ready garments are shipped to the retailers.

Garment sampling and product development

Sampling is making the proto type of the final garment. A designer first makes the garment design on paper. And at the development stage design concept is converted into garment using fabric and trims. Brands spend lot of time and resources on product development. They also work on developing fabrics, if they wish to use a new kind fabric for their designs. Different types of samples are made for different purposes. Samples made by a factory may include proto sample, size set sample, salesman sample and preproduction sample etc.Garment fitting, measurements, construction and raw materials are checked in multiple levels to ensure brands will get the desired product in bulk production. For domestic brands, they design their own product and get it manufactured. Prior to bulk production, a trial run is done with 50-100 pieces of a design.

Prasanta Sarkar

Garment pattern making

When we buy readymade garments we choose the garment that fits better to our body. A garment is made by joining various garment components together. Like a shirt has parts likecollar, cuff, sleeve, front panels, back panel, back yoke and front plackets. Do you know that afull sleeve shirt is made of about 20+different components?All garment components are cut from fabric sheet. To get correct garment fitting, all garment partsarecut following the specific dimension (measurements). For thiswe need garment patterns.

Factories makegarment patterns manually as well as by CAD software. Using CAD system, pattern making, pattern grading is done efficiently. A trained pattern master (technical person) is employed for pattern making.

Sourcing of fabrics, trims and packing accessories

We all know kapada (fabric) is the primary raw material for making garments. To make a garment we need various kinds of trims too depending on garment design. Common trim are like stitching threads, buttons, zippers, twill tape, laces, hook, snap buttons etc. Factory sources fabrics and all other itemsfrom the local market or from the buyer nominated suppliers. Prior to use these items, factory checks quantity and quality of the items. Checking of raw materials is done to ensure that only quality materials are usedin the following process. This ensures to get quality garmentsat the end of garment production.

Cutting garment parts

As mentioned above, to make a garment factory cuts fabricsinto garment parts. In mass garment production numbers of garments are made for thesame design and same size. Multiple fabric plies are cut together after layering fabricson the cutting table. After fabric layering, marker is made manually on the top ply using pattern paper or CAD generated maker sheet is laid on the top layer. A trained cutter cuts fabric following pattern outlines by means of cutting equipment. It may be a straight knife cutting machine, or a round knife cutting machine or automatic cutting machine. Cutting process involves various sub-processes, like fabric relaxation, layering, marker making, cutting, re-cutting, shorting and bundling, numbering of plies etc. Cut components are checked prior to sending the garment to next process.

Printing and Embroidery

You might have seen printed designs or/and embroidery designs on your clothes. Printing and embroidery work are value added but optional process.All designs may not have print and embroider work. Printing or Embroidery is only done if customer asked for it. Printing on garments is done either on full length fabric or on garment panels after cutting garment components. There is number of printing method and printing techniques for printing fabrics and garments. Even printing is done after making the complete garment. In case factory doesn't have in-house print / embroidery machines this process is outsourced.

Garment Stitching

You might have seen tailors to stitch garments in a tailoring shop. They normally use 2-3 types of sewing machines and one person makes the whole garment. In industrial production things are different.

Cut components aretaken into sewing section. Garments are stitched in assembly lines. Large numbers of stitching machines are installed in multiple sewing lines in the stitching floor. Stitching operators stitch garment parts together and assemble garments. One operator sews only one or couple of operations. Hence numbers of operators are involved in completing the stitching of a garment.

Just stitching garment parts are not enough. All garments must be defect free. To ensure stitching quality factory involves quality checkers to check the stitched garments in the line and end of the line. All defective garments are repaired in the line prior to sending garment to the next process.

Just for your information - different types of industrial sewing machines are used in industrial production. Lockstitch, overlock, flat lock, chain stitch, profile stitch, bar tacking, button attaching and button holing machines are to name some of the industrial sewing machines. Now-a-days various technologies are used for joining garment components (making seam). To learn more about garment manufacturing, you can refer my blog www.onlineclothingstudy.com

Alpine Expo Tex (P) Ltd

(House of Export Fabrics)

We at Alpine Expo Tex Private Limited are engaged in supplying woven fabrics for last 5 decades (in Greige, Dyed & Printed form) to Garment manufacturer and exporters in allover Delhi. We have all kinds of woven fabrics which are used for making Tops and Bottoms garments for Men's, Women's and Children's wear and also for use in Home furnishing.

Corporate Office cum showroom

M/s Alpine Expo Tex (P) Ltd.

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Garment washing

Being a customer we would never buy a soiled or stained garment. Brands know this. So factory takes care of garment presentation and finishing. Factory cleans all oil stains, pencil/chalk marks, dust by spotting or washing. Garment washing is done to remove dirt and dust from the garments. Washing of whole lot is done only if buyer needs washing for their orders. More than just cleaning of garments, washing is also done to give washed look to the finished garments, to improve softness and hand feel.For jeans and sweaters garment washing is must. Industrial washing machines are used for bulk garment washing.

Finishing of stitched garments

A stitched garment comes with lot of loose threads, long thread tails, numbering stickers, various kinds of stitching defects, raw material defects and handling defects. In finishing section thread trimming, sticker removing and spot removing are done. All garments are thoroughly checked to ensure product quality. Measurements of the garment are checked to ensure that garment specifications are strictly followed by factory and correct size label is stitched to each garments. All defective garments are repaired. Garments are pressed using steam iron to remove creases and wrinkles. After finishing garments get a new and fresh look.

Garment folding and packing

Nicely pressed garments are folded in a specific dimension. All garment accessories and tags like hangtags and price tags are attached to each garment. Folded garments are then packed into poly bags. Packing is done for individual garments or multiple garments are packed into a poly bag. Barcode stickers are attached to the price tags. Then garments are packed into a bigger carton.

Garment Inspection and quality assurance:

We have learned that garments are checked at stitching and finishing stages. At this stage finished and folded garments are audited for quality assurance of the products. Factory follows certain quality standard, and inspection procedure to audit the packed garments.

Let's take an example of an export order. In export orders, packed cartons are audited internally prior to handing over shipment to buyer quality inspection representative for final shipment inspection. Buyer representative inspects shipment using certain AQL standard. AQL means Acceptable Quality Level. Auditor preparesshipment inspection report. Based on inspection result auditor (inspector) decides whether to pass or fail the shipment. Passed shipment is sent to dispatch section. In case shipment failed, garments are rechecked and repaired.

Shipment delivery

Pass shipments are sends to buyers/retailers. For domestic order finished garments are sent to retailers' warehouse or directly to the distribution centers.Thus our favorite clothes reach to retails stores. It is a long journey of garments before they are put on display in a store. Since raw material purchase to reaching to retails shop may takes 30-100 days.

This was an overview of readymade garment manufacturing. What you have just read is the primary processes of garment making. In between these processes there are many other processes involved depending on the product designs. Every brand follows a different set of procedures to manufacture their designs. Also each product type demands a different set of processes, handling and finishing. Same product can be made with different set of machines and equipment. Every process and all variations of the same process can't be covered in a single article. Keep reading more books and articles on readymade garment manufacturing.

Opportunities & Challenges of Indian textile Industry

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Textile is India's one of the oldest industries and has a formidable presence in the national economy as it contributes to about 14 per cent of manufacturing value-addition, accounts for around one-third of our gross export earnings and provides gainful employment to lacs of people. People are engaged from cotton and jute farmers, artisans and weavers who are engaged in the organized as well as decentralized and household sectors spread across the entire country.

The growth of the industry over the years has been characterized by expansion in dimension, changes in fibre-mix, adoption of new technology and increase in availability of goods for home consumption and exports. In the spinning segment, has increased as the second largest in the world after China. Also weaving & process has been significantly increased with time. The rapid growth in the decentralized garment segment in the past decade or so has added to the dimension of the textile industry. The garment segment began initially as an export-oriented effort but it has grown in volume and diversity and the export of ready made garments now accounts for over 40 per cent of the value of total textile exports.

However, the industry has to work hard, improve certain areas of weaknesses and enhance its competitive strength not only to retain but also improve its position in the textile map of the world, particularly in the context of the emerging liberalisation and globalisation of textile product and trade. For this

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purpose, coordinated and complementary efforts are required on the part of the industry, the Central and State Government's Export Promotion Councils, Textile Research Associations and the like.

Labour Policy

Also the textile industry has the maximum deployment of manpower right after agriculture. Now govt policy is proposed minimum wages uto Rs350/- for unskilled operator & Rs600/- for skilled operator. This will give

textile industry a big blow. Although it is good move by government to increase the living standard of our country but cost of production per unit of yarn/fabric/garment will increase. Our domestic or export market is not ready to pay this extra cost. This will further reduce the profit margin of textile sector. India is now facing major challenges from Bangladesh, Vietnam, Cambodia & we are waiting to face the fresh challenge from Ethiopia & other African countries.

Technology upgradation

The rate of absorption of modern machinery and technology in the industry has been slow. This is increasingly affecting costs and productivity efficiency. The Government on its part has launched the Technology Upgradation Fund Scheme (TUFS) to give the industry access to timely and adequate capital at internationally comparable rates of interest for upgrading its technology and improving its competitiveness as well as long-term viability. The industry must take advantage of this opportunity and overhaul the outdated technology-mix being used in different sectors of the industry, particularly the decentralised sector.

Product Development

The future growth, particularly in export markets, will come mainly from exports of value-added items including made-ups and apparels. It is, therefore, imperative that our industry must gear up to integrated consumer tastes and preferences in their production and develop marketing infrastructure so as to service both domestic and international requirements timely and effectively. The industry can contribute towards development of marketing infrastructure through their own association and export promotion councils. The Government has set up seven National Institute of Fashion Technology Centres providing skilled human resources to the apparel and textile industry. Besides, the Government has equipped certain Powerloom Service Centres, Weavers Service Centres and Training Institutes. The industry can take help from these organisations in meeting their design requirements. It has also been decided to set up a National Design Centre for Handlooms.

Joint Venture

It is important to note that the production environment in textiles all over the world is undergoing changes. Countries are trying to complement their own comparative advantage, whether in technology or in raw materials or in finance, by forging joint ventures or production or marketing tie-ups with other countries to increase their overall competitive strength. The Indian textile industry may also like to explore this route for enhancing comparative advantage and convert it into competitive strength.

Value added business

We need to explore new areas of technical textiles where we import textile products from developed countries. There is tremendous potential to grab new business with very good profit margin. These products include medical textile, geotextile, building textile, high altitude textiles for defense, protecting fabrics & other work & wear fabrics.

Hopes for new

Needless to say that the textile industry has several challenges ahead and re-orientation of the industry, both organic and systemic, is required to enhance its competitive strength and improve its global positioning in the new millennium. In this effort, the Government's initiative, some of which have been outlined above, may not be sufficient. The industry including the textile machinery sector and related organisations must supplement these initiatives in a more proactive manner, so that the industry achieves cost reduction, attains quantum jump in quality production and improves delivery systems.

Source: Ministry of textiles reports & some other web documents

Vilmed Nonwovens in Medical Applications

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Medical textiles are textile products and constructions for medical & biological applications. Design of medical textiles is driven by its end function. The textiles need to fulfil the purpose for which it was designed, e.g. Swabs need absorbent textiles whereas sutures may need biodegradable textiles. Medical textiles are broadly divided into following four segments based on their applications. These are Non-implantable, Implantable, Extra Corporeal, Healthcare Hygiene products and Hygiene products.

Apart from these we also have Nonwoven for transdermal patches commonly used as pain reliever and nonwoven carbon fibre disc filter pads to arrest bad odour.

The products that fall under above segments are as follows:

Non implantable	**Implantable**	**Extra Corporeal**	**Healthcare Hygiene Products**	**Hygiene Products**
Absorbent pads	Biodegradable sutures	Artificial kidney, liver	Surgical gowns	Feminine Hygiene
Wound contact layer	Artificial tendons, ligaments, skin, cartridge	Mechanical lung	Surgical caps	Diapers

Nonwoven backings: fast processing, reliable quality

Vilmed® Nonwovens used as backings for wound dressings and plaster strips can be coated with adhesive and have a high tensile strength. This means further processing is simple and effective. In practice soft and flexible Vilmed® Nonwovens conform perfectly to the contours of the body. Since they offer good permeability to air, they are particularly kind to the skin. Vilmed Nonwoven backings have excellent abrasion properties and a water repellent finish. Vilmed Nonwovens can be sterilised and are available in both white and beige.

Subhamoy Banerjee

- breathable, water repellent
- conform perfectly to body contours
- high tensile strength, excellent abrasion properties

Nonwovens for wound pads: versatile and effective

When selecting raw materials particular attention is paid to absolute safety. Vilmed® Nonwovens are bonded thermally and therefore free of bonding agents, further enhancing tolerance. The non-adherent surface encourages the healing process. Additional finishes such as antiseptic treatment, printing and colouring provide a basis for tailoring the products to customerrequirements. Vilmed Nonwovens can be sterilised and are available with various surface structures.

- physiologically safe raw materials
- permeable to air, non-adherent to wounds
- highly absorbent, fast flow of Secretions

Traditional Wound Care

Nonwovens for compresses and coverstock for fast débridement

Vilmed® Nonwovens for medical applications stand out for the numerous advantages they offer, both with regard to user requirements and material properties. Apart from the characteristic features of comfort and kindness to the skin the range of other special properties includes non-adherent compress surfaces and high absorbency in particular. This helps make Vilmed compresses ideal for the care of both dry and secretory wounds, since blood and secretions are passed on to the absorbent pad thanks to the special fibre structure. They do not stick to the wound, with the result that changing dressings does not hurt and is particularly gentle, since the wound is left untouched for the healing process. Where manufacture of absorbent compresses with particularly high absorbency of secretions is concerned, our Vilmed® Nonwovens come into their own as coverstock: their outstanding feature is the open-pore nonwoven structure, which in clinical applications ensures optimum flow of secretions to the absorbent layer. This helps Vilmed® coverstock makedébridement even faster. At the same time the non-adherent properties of the soft and gentle nonwovens are invaluable in the wound healing process.

- without bonding agents
- soft, kind to the skin
- non-adherent to the wound
- absorbent, fast flow of secretions
- sterilisable
- various surface structures

Coverstock

Nonwoven Adhesive Tape Substrate

Vilmed® adhesive tape substrates are available in the colours white and beige. Upon request the substrates can be provided with a water-repellent finish. They can be coated with adhesive in further processing using all common technologies.

- breathable, kind to the skin
- easy to use
- can be coated with adhesive
- with water-repellent finish if desired

Oriented to consumer needs, unlimited potential

Applications for Vilmed Nonwovens in medicine range from adhesive tape substrates to wound pad materials. Thanks to the multitude of possible combinations of various types of fibres, bonding processes, manufacturing, finishing and processing methods we succeed in achieving a wide range of

Adhesive Tape Substrate

product characteristics. In addition to the material properties of comfort and kindness to skin, there are other special features: non-adherent surface, attractive appearance, absorbency, air permeability, tensile strength and stretch properties. This diversity provides the basis for complete satisfaction of product requirements, which are defined by the respective applications.

Carefully directed effects resulting from defined properties

The outstanding features of Vilmed Nonwovens for backings and wound pads in wound dressings and plaster strips are the particular advantages offered by the material: they are easy to process, permeable to air, non-adherent to wounds and highly absorbent properties of benefit to manufacturers and end users alike. Medical products for care of wounds that are based on Vilmed Nonwovens are put to successful use both in post-operative wound care and in treatment of minor injuries.

Put to the test every day – proven over time

The success with Vilmed® Nonwovens for medical applications is based to a great extent on the typical advantages offered by this material. In particular the adhesive tape substrates offer outstanding features such as comfort for the patient and kindness to the skin. Vilmed® adhesive tape substrates are made from wet-laid nonwovens and have been successfully used for years in the medical dressings industry as they are put into use in clinical applications every day, for example to secure dressings or tubes. They are easy to use and to tear off, and these features too been have proven in practice.

Kind to the skin and designed with application in mind

A soft, clingy nonwoven substrate is produced from carefully selected raw materials. Breathable Vilmed® substrate provides the basis for your final product, an adhesive tape which is kind to the skin: since it is breathable, skin irritations such as macerations, which are caused when air is not allowed to circulate, are ruled out from the start. Another plus in everyday use is the water repellent property of the nonwovens used: even when damp, adhesive tapes made from Vilmed do not need to be changed immediately.


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Evaluation of Thermal Protective Performance of Firefighters' Clothing

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As a result of the extensive use of combustible substances in recent years, fire hazards have become more complicated,which hassubsequently increased the demand for better safetymeasures for firefighters. In India, many fire incidences happened in the last few years –Delhi Uphaar Cinema fire in 1997, Meerut fire in 2004, Jaipur oil fire in 2009, Kolkata AMRI hospital fire in 2011, etc. In these fire incidences, every year numerous firefighters get burnedand many of them also lose their lives while fighting fires, rescuing people or responding to hazardous material incidents. The best way for firefighters to mitigate skin burn injuries andreduce risk of death from fire hazards while on duty is touse high performance thermal protective clothing. There are various garment manufacturers around the world, who can commercially produce firefighters' protective clothing. These manufacturers are: DuPont – USA, Davey Textile Solutions INC – Canada, Trans-Textil GmbH– Germany, etc. In India, although there are a lot of reputed garment manufacturers in field of fashionable clothing, there are very few manufactures in the field of thermal protective clothing. In this context, it is notable that the manufacturing of high performance thermal protective clothing requires state-of-the-art testing facilities for properly evaluating the thermal protective performance of the clothing.

In order to properly evaluate the thermal protective performance of the clothing, it is always required to understand the thermal exposures faced by firefighters; then, it is necessary to simulate these thermal exposures in the laboratory to evaluate the protective performance. Generally, it has been found that firefighters can be exposed to various thermal exposures – flame, radiant-heat, hot surface, steam, hot-water, and molten metal substances. By simulating these thermal exposures, different standardized or

Dr. Sumit Mandal

customized test methods have been developed to evaluate the protective performance. These test methods are frequently used to evaluate the performance of thermal protective fabrics and clothing (Mandal, 2016; Mandal, et al., 2013).

Evaluation of thermal protective performance of fabrics

In the last few decades, different standard organizations [International Organization for Standardization (ISO), Switzerland; American Society for Testing and Materials (ASTM), USA; Canadian General Standards Board (CGSB), Canada] have developed the bench-scale

test methods to evaluate the thermal protective performance of fabrics under various thermal exposures.For example, 1) ISO 9151, ASTM 4108, ASTM F 2703, and ASTM F 2700 standards are developed for flame exposure, 2) ASTM F 1939, ASTM E 1354, ISO 6942 standards are developed for radiant-heat exposure, 3) ASTM D 7024 and ASTM F 1060 standards are developed for hot surface contact exposure, 4) ASTM F 2701 standard is developed for hot-water splash exposure, and 5) ASTM F 955 standard is developed for molten metal substance exposure. By using these standards, the protective performance can be evaluated in terms of 'heat transfer performance of fabrics', 'radiant heat resistance of fabrics', and/or 'time required for generatingthe second degree burn injury on wearers'. Recently, Mandal (2016) developed some customized methods to evaluate the protective performance of fabrics under steam and hot-water immersion with compression exposures (Mandal, et al., 2016). He also customized some standard– ISO 9151, ASTM E 1354, ASTM F 1060, and ASTM F 2701 – to effectively evaluate the protective performance of fabrics under various thermal exposures – flame, radiant-heat, hot surface, and hot-water splash (Mandal, et al., 2013; Mandal, et al., 2014). Recently, he is attempting to develop some new methods for evaluating the protective performance under flame and radiant-heat exposures that will be applicable for firefighters' as well as industrial-workers' clothing.Overall, these bench-scale test methods are less expensive and can accurately measure the thermal protective performance of fabrics; however, these tests cannot accurately represent the thermal protective performance clothing made by these fabrics.

Evaluation of thermal protective performance of clothing

In order to evaluate the thermal protective performance of clothing, ISO 13506 and ASTM F 1930 standard are frequently used. In these standards, a full-scale manikin is instrumented with sensors;then, the clothing that needs to be tested is put on the manikin and the clothed manikin is engulfed into flash fire (generates from 8 or 12 propane gas burners) for certain duration (Figure 1). After the flash fire exposure, thermal energy (heat flux) transmitted through the clothing is measured by the instrumented sensors. This heat flux values are used in software (that is programmed according to the Henriques Burn Integral Equation) to calculate the time required to generate the burn injury on human body (manikin) while wearing clothing. Additionally, the percentage of burn injury on human body under flash fire exposure is also calculated.

Towards the end of 20th century many universities and researchers have attempted to develop the manikin by using unique type of sensors that can accurately represent human skin. For example, DuPont – USA have developed the manikin 'Thermo-Man', University of Alberta – Canada have developed the manikin 'Harry Burn', and North Carolina State University – USA have developed the manikin 'PyroMan'. Although the size of these manikins is same (40 size male body), the types of sensors instrumented on these manikins are different and developed by these universities and research organization.For example, 'Thermo-Man' is instrumented with embedded sensors, 'Harry Burn' is instrumented with skin simulant sensors, and 'PyroMan' is instrumented with PyroCal sensors. Additionally, the used software programs with these manikins are also developed by the respective universities and research organization. Recently, some other organizations have also installed these manikins in their laboratory. These organizations are:Empa – Swiss Federal Laboratories for Materials Science and Technology, Switzerland; British Textile Technology Group (BTTG), United Kingdom;Aitex Certification

Protect, help the healing process:
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Laboratory, Spain; Dankook University, Korea; Donghua University, China; CTT Group, Canada; and SENAI-CETIQT, Brazil. Some of these organizations have also developed the female body form of these manikins or burn injury calculating software. For example: BTTG have developed female instrumented manikin and Empa, Switzerland have developed the burn injury calculating software. This Empa software is now installed in BTTG and Aitex. Recently, University of Alberta, Canada has also developed a manikin that can evaluate the thermal protective performance under hot-water spray exposure (Mandal, et al., 2014).

Summary and Conclusion

Based on the above discussion, a lot of standard and customized methods have been developed to evaluate the thermal protective performance of fabrics and clothing. By using these methods, many researchers (Mandal, 2016; Song, 2004; Torvi, 1997) have also evaluated the protective performance of fabrics and clothing. In this context, it is notable that thelatest instrument and trained personnel are required to effectively evaluate the protective performance,and these resources are available only in few laboratories of the world. Three pioneer laboratories in this area are: Laboratory for Protection and Physiology, Empa, Switzerland; Protective Clothing and Equipment Research Facility, University, Canada; Textile Protection and Comfort Center, North Carolina State University, USA. Currently, some other laboratories in the world are also operational to evaluate the thermal protective performance of fabrics and/or clothing. There laboratories are namely Personal Protective Equipment Center, Dankook University, South Korea; Protective Clothing and Research Center, Donghua University, China; Center of Excellence for Protective Textile, Northern India Textile Research Association, India. However, it is always required to involve trained research personnel and engineers to effectively install and operate the new fabric and clothing testing facilities under various thermal exposures. Additionally, it is also required to evaluate the comfort performance of thermal protective clothing for better safety of firefighters.

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Glimpse of Personal Protective Equipment and Its Testing Regulations, CE Marking

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A Personal Protective Equipment (*PPE) can be defined as:*

- Any device or appliance designed to be worn or held by an individual for protection against one or more health and safety hazards and shall include:
- A unit constituted by the several devices or appliances which have been integrally combined by the manufacturer for the protection of an individual against one or more simultaneous risks
- A protective device or appliance combined , separable or inseparably, with personal non-protective equipment for the execution of a specific activity
- Interchangeable components which are essential to its satisfactory functioning and used exclusively for such equipment

Classification of PPE

PPE is categorized into different risk levels for assessment:

Simple (cat I) - Designed to protect against risks that the user can assess for themselves and the effects of which are can be safely identified by the user in good time.

Complex (cat III) - Designed to protect against mortal dangers or dangers that may seriously irreversibly cause harm or where the user cannot identify the immediate effects of the danger in good time.

Intermediate (cat II) - Anything which is neither “simple” nor “complex”

Simple PPE

- Superficial mechanical risks (e.g. gardening gloves , thimbles)
- Weak chemicals whose effects are reversible (e.g. gloves for protection against hose hold chemicals, cleaning agents)
- Thermal risks not exceeding 50 degree C
- Dangerous impacts (e.g. gloves or aprons for professional use)
- Atmospheric agents of neither exceptional or extreme nature (e.g. Hats, Seasonal Clothing, Footwear)
- Sunlight (e.g. sunglasses – excepting for special environments such as at altitude or high reflection)
- Minor impacts and vibrations which do not caused irreversible lesions (e.g. light use helmets)
- Self Certification

Suvodeep Mukherjee

Complex PPE

- Filtering respiratory protectors.
- Respiratory protection for full insulation (e.g. diving)
- PPE providing limited protection from chemicals or ionizing radiation
- Emergency equipment for use in high temperature environments (over 100 degree C) or low temperature environments (below air temperature of -50 degree C)
- Protection against fall from heights
- Protectors against electrical risks and dangerous voltages

Conformity of intermediate PPE

- By means of EC Type Examination (article 10)
- Notified Body assesses Technical File to ensure essential requirements are met
- An actual products is examined for compliance with the technical file details, safe use
- EC Type Examination Certificate issued by Notified Body

Technical Documentation

- Technical files must be submitted for items requiring EC Type Examination
- Technical file contains the Who, What, Where and Why information regarding the product. Must include all the relevant data on which manufacturer relies to ensure compliance with essential requirements
- File may relate to multiple samples if products are related (i.e gloves of differing styles/but same materials)
- BVCPS India is able to assist you with the compilation of your technical files.

Testing Laboratories

- Laboratories must hold Accreditation for the harmonized standard or for the individual tests involved held from an organization covered by the MRA.
- BVCPS India Private Ltd. New laboratory opening in Noida has facility to offer these services Inhouse for Gloves. Other product ranges scheduled to be added in future.
- Prior to this BVCPS India Private Ltd. Can assist with testing utilizing BVCPS GERMANY facilities.

What is CE marking?

Symbolises that a product so marked complies with the relevant community requirements as imposed on the manufacturer. It is a declaration by the manufacturer that those requirements have been met in full. It is a declaration that all conformity procedures have been completed.

What items should I CE mark?

CE Marketing is applicable to Toys, Personal Protective Equipment, Medical Devices, Pressure Vessels inc Hot water boilers, Gas appliances, Electrical Equipment inc Radio Telecommunications equipment, General machinery, etc. If multiple Directives apply and require CE marking, use of CE mark implies conformity with all applicable Directives.

The CE Mark

Must be at least 5mm in height, all characters must be same size, may be accompanied by the identification number of a Notified Body involved in assessment for complex category 3 PPE, shall be visible, legible and indelible for lifetime of product

Who applies the CE Mark?

CE mark is applied by the “responsible person”. This is either:

- the manufacturer or his authorised agent established within the European Community or
- The person who places the PPE on the market (providing that the manufacturer or his agents are not) established with the European Community (directive 89/686/EEC Article 2 Paragraph 3)

Impact Resistant Protective Textiles

DR M K TALUKDAR
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Protective Textiles deal with protection. But protection has been very basis of textiles from their origin. If we look back to the history of primitive man and the gradual use of leaves – bark and natural fibre and textiles, we discover that protection against weather and climatic conditions was the objective of textiles and clothing. Yes, with civilization and scientific growth, textiles and clothing have undergone many phenomenal changes. We have seen clothing ranging from country to country and even sex to sex. For example, Dhotis and Sarees are unique to our country. And even Dhotis and Sarees, as we move from north to south and east to west, change dramatically both in size and form. But irrespective of this, it is one size and form or the other, whether it is one fashion or the other, whether it is bisexual or unisexual dressing material, does any textile do away with the concept of protection. The answer would certainly be "NO". Thus, any textile in one way or other has an inbuilt characteristic or function of protection.

Personal protective textiles are so complicated that no single classification can clearly summarize all kinds of protection. Depending upon the end use, personal protective textiles can be classified as industrial protective textiles, agricultural protective textiles, military protective textiles, civilian protective textiles, medical protective textiles, sports and space protective textiles.

Personal protective textiles can be further classified according to the end use functions such as thermal protection, flame retardant protection, chemical protection, mechanical impact protection, radiation protection, biological protection, electrical protection and wearer visibility protection.

Dr M K Talukdar

Mechanical Impact Protection

With advancement in science and technology, and with globalization, we can feel the discernible improvement in standard of living. On the other hand, it is unfortunate that we cannot find mankind at rest. It may be on the name of super power, it can

be on name of caste, creed or religion even it can be on the name of protecting mankind, the world is not free from wars, free from aggression, free from military actions and most concerning not free from terrorism. Thus the range of hazards and the means of combating them are growing and continue to grow and become more complex. A consequence of this development and exploitation of new fibres, structures and clothing systems whose purpose is to provide improved protection, whilst maintaining comfort, efficiency and well-being.

Ballistic armor is designed on both the type and level of threat. For example, choice of textiles and its area density depends on the type and velocity of the projectile as well as the expected degree of comfort and level of protection. The kinetic energy of the penetrating object must be absorbed by the fibrous net work and dispersed to prevent localized damage. Threats can be classified as follows:

Fabric specifications are given below:

Linear density, dtex	**Filaments, No**	**Strength at break, N**	**Tenacity at break, mN/tex**	**Elongtion at break,%**	**Chord modulus, Gpa**
550	500	135	2370	3.45	91
840	1000	215	2500	3.50	92
930	1000	225	2350	3.50	90
1100	1000	267	2350	3.50	90
1680	1000	385	2350	3.50	90
3360	2000	688	1990	3.70	97

Factors that Influence Ballistic Performance

The heart of a ballistic protective vest is the yarn. Normally para-aramid and ultra high molecular weight fibres (UHMWF) are used. These fibres are characterized by its high tenacity, high modulus of elasticity, low density and high energy absorption. General characteristics of these fibres are:

- Mechanical and Dynamic Properties
  - i) High tensile strength and modulus of elasticity
  - ii) Low density
  - iii) Good vibration damping
  - iv) High energy absorption
  - v) High toughness
  - vi) Low Fatigue
- Chemical Properties
  - i) Good chemical resistance
- Thermal Properties
  - i) Heat resistance
  - ii) Low heat expansion
  - iii) Low heat conductivity
- Electrical Properties
  - i) Good dielectric properties
- Textile properties
  - i) High Flexibility
  - ii) High abrasion resistance
  - iii) Wear comfort

Properties of yarn

However, the bullet proof vest will be only effective if the yarn is properly processed.

Anti-Ballistic Fabric

The quality of the vest is largely determined at the weaving stage. The factors that influence id performance include the type of equipment used, the fabric construction and strength, its crimp level, finishing treatment etc. Improper weaving will reduce the ballistic resistance. If the fabric is woven too dense, too much damage to the yarn will decrease ballistic performance. If the fabric is woven too loose, not enough filaments encounter the projectiles. Plain weave gives best performance since it has maximum cross-over points.

Finishing

Humidity is another factor influencing ballistic performance. Water in a ballistic fabric behaves like a lubricant between projectile and protective layers necessitating protection against water penetration. This is achieved by welding the fabric into a water proof cover. However, during use of a vest the cover may be damaged and humidity may then penetrate. A water repellent treatment

Threat	Velocity, m/s	Kinetic energy (J)	Present Area, mm²	Kinetic Energy Density (KED) J/mm2	Typical armor type
Knife	10	43	2.5(blunt) 0.2 (sharp)	17 210	Special textiles and plates
Hand gun bullet (0.357")	450	1032	65(initial) 254(final)	16 4	Textiles
Assault rifle bullet (AK47)	720	2050	45	45	Composites
High velocity bullet (SA 80)	940	1805	24	75	Ceramic

Particulars	Aramid	HM Aramid	High Density Polyethylene
Specific Density, g/cc	1.44	1.45	0.97
Tenacity mN/tex	195	195	309
Modulus of elasticity, Gpa	70	121	2000
Elongation at break, %	3.6	2.1	2.7

Level	Round	Caliber	Ammunition Type	Mass	Minimum bullet velocity
I	1 2	38 Special 22	RN Lead LRHV Lead	10.20 g 2.50	259 m/s 320 m/s
II-A	1 2	0.357 Magnum 9 mm	JSP FMJ	10.20 g 8.00 g	381 m/s 332 m/s
II	1 2	0.357 Magnum 9 mm	JSP FMJ	10.20 g 8.00 g	425 m/s 358 m/s
III-A	1 2	0.44 Magnum 9 mm	Lead SWC FMJ	15.55 g 8.0 g	426 m/s 426 m/s
III		7.92 mm Win	FMJ	9.70 g	838 m/s
IV		30-06	AP	10.80	868 m/s

AP : Armor piercing JSP: Jacketed soft point RN: Round nose
FMJ: Full Metal Jacketed LRHV: Long rifle high velocity SWC: Semi-wad cutter

eliminates the risk of damage being caused if the cover is perforated.

The water repellent treatment is applied after weaving, before processing and keeps the humidity out of fabric.

The performance of the vest is defined as:

- Adequate resistance to projectiles in accordance with the required protection class.
- Trauma resistance
- Maximum weight of the garment or the inserted ballistic fabric panel.

Number of Layers

- Depending on protection level and fabric style from 7 - 50 layers
- Yarn manufacturers recommendations
- Weavers quality in weaving
- May use Aramid or Polyethylene or a combination of both
- Aramid has best projectile stopping properties and is flexible
- Polyethylene has good trauma absorption properties - But is very stiff. +

Testing Standards of Ballistic Vests

A small bullet fired at bullet proof fabrics encounters fewer threads than a large bullet. A fast small bullet with the same total energy of a large slow bullet will penetrate body armor much deeper. A 0.357 magnum from a revolver is

therefore easier to stop than a 0.22 magnum from a rifle. Additionally, the harder bullets do not deform on impact as much and penetrate more that softer bullets. A deformed bullet will encounter more aramid fibres and is more likely to be defeated.

Stopping the bullet is only part of the problem. As aramid does not stretch, when a bullet is contained, the energy is absorbed and dispersed from the struck fibres to other fibres in the weave of the fabric and ultimately to the body. This shock to the body is know as blunt trauma and must be kept at a level where injury from it does not occur. The human body can withstand a certain amount of blunt trauma and this tolerance to it is referred to in millimetres of "back face signature" during testing of body armor.

There are numerous different test standards around the world. The oldest and best known standard is by the U.S. National Institute of Justice and known as N.I.J. 0101.03. This standard allows for a back face signature of 44mm when body armor is tested. This is regardless of level of protection the body armor offers. Other standards used, such as the U.S. PPAA Standard 1989-05 also use 44mm as the maximum allowable blunt trauma, but requires less shots fired against the armor being tested. Some armor that passes for instance the PPAA standard may still fail the NIJ standard during testing.

As there is a lot of confusion about the various test standards, the harder NIJ standard is used by law enforcement agencies in the USA and generally in other countries which do not have their own test standards. The NIJ standard is also required by all of our Asian and Middle East customers. In Europe, German standard Schutzklasse "L" which allows only 40mm blunt trauma for concealment vests (Covert Armor) and 20mm blunt trauma for any type of vest which is worn over clothing (Overt Armor) is followed. In Great Britain Home Office requirement of 25mm blunt trauma using the NIJ test standard is followed. . This clearly demonstrates that the NIJ Standard and its test method is most widely used standard in the world.

There are basically six protection levels under the NIJ standard ranging from Level I for .38 revolver to Level IV for 0.30-06 Armor Piercing Rifle Ammunition and allows to test with any type of ammunition using the prescribed test methods, NIJ Standard is given below:

Conclusion

The ballistic resistance of soft ballistic material is determined by three factors of equal importance viz, fiber, fabric and making-up. The vest must be designed so as to cope with a velocity substantially higher than the ballistic limit.

SleepSafe: Develop Safe Habit of Sleeping

KRISHNA KUMAR BAHETI
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We spend nearly 1/3 of our lives in bed, which makes protecting our sleep environment not just a good practice, but a healthier practice as well. Mattress & Pillow covers are a fitted layer above your mattress/ pillow and are not washed daily, resulting invasion of dust mites and bed bugs. Moreover most families will have several fluid spills on each of their mattresses attributed to children, pets, incontinence, drinks and even ceiling leaks. To protect you and your family, mattress and pillow protector products are designed to improve health and offer fluid protection.

Dust Mites Protection

Dust mites are microscopic bugs that live off of dead skin cells and animal dander. Dust mite's preferred place of residence is the mattress where skin cells are plentiful. The average person sheds over 1/3 of an ounce worth of skin cells per week proving a constant supply of food for dust mites. The main issue with dust mites is their microscopic fecal matter left behind daily, which creates issues for those with allergies and asthma. Just one mattress can be home to over 10 million fecal matter producing dust mites. Cleaning your sheets often is not enough to keep dust mite populations down as they can also be found living on the surface of your mattress, which is seldom if ever cleaned. Some frequently vacuum the surface of their mattress, but the best way to reduce dust mite populations is through a bedding encasement or mattress protector. By applying a protection product, dust mites cannot penetrate into the mattress making it easier to remove dust mites. Periodically washing your protector or encasement with your sheets will kill the dust mites and remove their leftover fecal matter. Dust mites are a constant problem for many who suffer from daily allergy and asthma triggers. By reducing dust mite exposure to the mattress, the sleeper can better control their sleep environment resulting in a reduction in allergy triggers and better air quality.

Krishna Kumar Baheti

Bed Bugs Protection

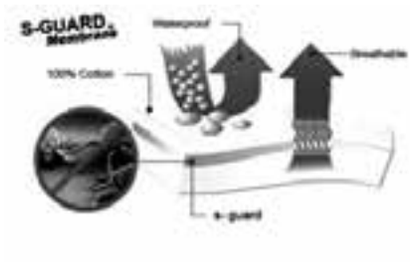
Bed bugs, of the Cimicida family, are small visible bugs the size of an apple seeds that feed on warm-blooded animals. Contrary to popular belief,

cleanliness and hygiene have nothing to do with bed bugs. Bed bugs, unlike cockroaches, do not feed on garbage so keeping a clean home will not prevent you from having bed bugs. All that is needed for a bed bug infestation is simply exposure to one.

Bed bugs can be eradicated through the use of a professional pest control operator or by purchasing treatment products and following a proven treatment protocol. Along with either course of action bedding encasements should be applied. Bedding encasements protect your mattress and box spring against invading bed bugs and well as treat mattress sets that are infested with bed bugs. One of the biggest mistakes people make is to throw away their mattresses. If the mattress or box springs are ever infested, they can be easily encased with bedding covers trapping any hiding bed bugs inside. Eventually these hiding bed bugs will die of starvation as they can only feed on a live blood source.

Urine and Fluids Protection

Just one fluid accident can completely ruin an unprotected mattress and void its manufacture warranty. Mattresses are more expensive than ever making mattress protection a smart investment to ensure years of use. SLEEPSAFE Mattress & Pillow Protectors are waterproof and breathable, which prevent small or large fluid accidents from permanently soiling your mattress and provide a more sterile sleep environment. If a spill or fluid accident occurs, simply remove the protector and place directly into the washing machine with normal detergent that does not contain bleach.



Sleepsafe Mattress Protectors, a product from Swasan group for the retail and hospitality sector, offer protection against dust mites, fluids, urine, perspiration, allergens and bacteria making them especially helpful for those with kids, pets, allergies, asthma or incontinence. With just one fluid accident, a mattress can be completely ruined or left with a permanent stain or odor. Sleepsafe protectors safeguard your mattress against fluids and stains offering a more sterile sleeping environment. SLEEPSAFE encased & zippered waterproof pillow protectors and Bed Bug Encasements operate silently and provide protection from dust mites, bed bugs, allergy triggers and fluids.

All these are made with hypoallergenic waterproof Cotton Terry fabric and the special s- guard membrane with hygienic function below the Fabric Layer, which acts as a barrier against Bacteria, Virus, Bed bugs, Dustmites, Liquids,etc,providing good cleanliness and Hygieneic sleeping comfort.

To prevent heat buildup keeping our protectors cool and noiseless, the surface material is made with soft cotton terry back coated with a breathable polyurethane membrane. To ensure a great fit, an elastic band is used on the side skirt to automatically pull excess material under the mattress. Sleepsafe pillow protectors are also recommended for added dust mite, fluid and allergen protection. At ShubhSwasan & Sleepsafe we frequently adapt to the latest technology & demand by continually researching and developing new ideas in order to lead the industry in both quality and product features. The best way to lead is to listen, which is why we interact with retailers and actual customers to find out how we can improve our products. We are launching SLEEPSAFE Foundation as part of our Giving Back to the Society to serve the community that makes our business possible be part of the socially responsible members of the society.

Seminar on "Technical Textiles: The Next Big Opportunity"
India International Centre, New Delhi
25th September 2016
Tentative Seminar Schedule

Registration **9:30 Hrs – 10:00 Hrs**

Inaugural Session **10:00 Hrs – 10:35 Hrs**

Welcome Speech by Dr. Prabir Jana, President, TANTU
Launching of Annual Souvenir of TANTU
Keynote Address by Dr. Amalesh Mukhopadhyay, Advisor, Dept. of Science & Technology

Panel Discussion 1 **10:35 Hrs – 11:35 Hrs**

WELLNESS & MEDICAL TEXTILES

Chair: Dilip Gianchandani, COO, Fibre 2 Fashion

Panelist:

- Dr. P J Singh, Managing Director, Tynor Orthotics, India
- Mr. Krishna Kumar Baheti, Director Technical, Shubh Swasan India Pvt. Ltd.
- Dr. Rabi Chattopadhyay, Professor IIT, Delhi
- Mr. Subhamoy Banerjee, Senior Marketing Manager, Freudenberg Performance Material

Tea Break **11:35 Hrs – 11:50 Hrs**

Presentation 1 **11:50 Hrs – 12:10 Hrs**

Personal Air Filtration applications by Mann+Hummel India

Presentation 2 **12:10 Hrs – 12:30 Hrs**

Nonwovens in medical applications by Freudenberg India

Panel Discussion 2 **12:30 Hrs – 13:50 Hrs.**

SAFETY & PROTECTIVE WEAR

Chair: Deepak Mohindra, Editor in Chief, StitchWorld

Panelist:

- Dr. Mrinal Talukdar, Director Technical, Kusumgar Corporate
- Mr. Anurag Singhal, Managing Director, Sai Synergy LLP
- Dr. Arindam Basu, Director General, NITRA, COE for Protective Textiles
- Mr. Gaurav Kumar, Marketing Director, Excel Global
- Dr. Mukesh Sinha, Scientist E (Dy. Director), Defence Research Development Organisation

Vote of Thanks by Sanjib Sinha, General Secretary, TANTU **13:50 Hrs - 14:00 Hrs**

Networking Lunch **14:00 Hrs – onwards**

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