2012-13

Technology Mission on Technical Textiles

Compendium on Centres of Excellence

सत्यमेव जयते

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Government of India

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ANAND SHARMA, M.P.

सत्यमेव जयते

वाणिज्य एवं उद्योग तथा वस्त्र मंत्री
भारत
MINISTER OF COMMERCE, INDUSTRY & TEXTILES
INDIA

MESSAGE

The textiles industry has played a vital role in nation building. Government of India has proactively supported and encouraged potential upcoming areas in this sector. With a view to posit India as a global leader in the realm of Technical Textiles, Government of India has adopted a multi-pronged interventional strategy of heavy infrastructure investments to increase global competitiveness and enhance the skill base of the industry.

Realising the importance of this sector, Government of India has announced the Technology Misison on Technical Textiles for a period of five years with a fund outlay of Rs. 200 crores. An important facet of this Mission is the creation and promotion of indigenous Centres of Excellence (CoE) of international standards to facilitate informed awareness and sustained capacity building of the industrial human resource relating to technical textiles. In addition to the existing CoEs, four new CoEs are being set up for Non Wovens, Composites, Indutech and Sportech with the object of training over a lakh people in the next few years. With a proposed allocation of Rs. 900 crores in the twelth five year plan, the developments in this sector will definitely be worth watching.

It is very heartening to know that a compendium focusing exclusively on the activities of the various Centres of Excellence is being published. I am positive, this compendium will prove to be a useful data bank for the various stakeholders and will go a long way in establishing a continuous, multi dimensional dialogue with our domestic and international partners, enriching our mental landscapes.

ANAND SHARMA

जय हिन्द

श्रीमती पनबाका लक्ष्मी
Smt. PANABAAKA LAKSHMI

सत्यमेव जयते

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MINISTER OF STATE FOR TEXTILES
GOVERNMENT OF INDIA
UDYOG BHAWAN, NEW DELHI

Message

It gives me great pleasure to learn that a Compendium on the Centers of Excellence on Technical Textiles is being published to provide a comprehensive overview on the important activities initiated by the various nodal agencies appointed by the Central Government in this field. With an objective of shaping Indian Industry as a strategic player in these emerging sectors, these Centers of Excellence established under the Technology Mission for Technical Textiles are undertaking a wide gambit of activities to enable comprehensive support to the industry. The Central Government has provided significant funding to ensure that these Centers of Excellence can provide cutting-edge services in these sectors.

I am confident that the Compendium will be a valuable resource to all stake holders as they pursue innovation and shape products for the future.

Panbaka Lakshmi

(Panabaaka Lakshmi)

Place: New Delhi
Dated: August 11th, 2011.

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सचिव
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Message

Technical Textiles is the emerging area for investment in India. The potential of technical textiles in India is still untapped. Technical textiles represents a multi-disciplinary field with numerous end use applications. The production of different items of technical textiles industry has been slowly but steadily increasing in the country. The field of technical textiles is a fast emerging area and Sub-Group on technical textiles has projected a growth rate of 20% in 12th five year plan. The Govt. has taken many steps in a structured manner for growth and development of technical textiles.

Under the scheme for Growth and Development of Technical Textiles, four Centres of Excellence were established in the field of Protective textiles, Geotextiles, Agrotextiles and Medical Textiles. These Centres of Excellence are equipped with latest testing facilities with national/International accreditation, Information centre, Prototype development facilities, Facilities for training etc. Besides this, a baseline survey on technical textiles was done and more than 60 awareness programmes were carried out across the country.

Govt. has recently launched the Technology Mission on Technical Textiles (TMTT) with a fund outlay of Rs. 200 crore. The aim of TMTT is to address issues like lack of basic infrastructure in terms of testing facilities, lack of market development support, skilled manpower, lack of R & D, absence of regulatory measures, absence of specifications and standards for technical textiles etc. Under the Technology Mission on Technical Textiles, four more centres of excellence in the area of Composite, Non-Wovens, Indutech and Sportech are under establishment.

It gives me immense pleasure that NITRA, with support of the Ministry of Textiles, is bringing out a compendium of facilities available in the Centres of Excellence. This compendium provides a status update on the available facilities, as also the activities being undertaken by the various CoEs and the initiatives planned over the next few years.

This publication is an effort to facilitate easy access to information in this field and is recognition of the need to shape a proactive communication with the industry. I am hopeful the information provided here will enable the Industry at large to better connect with the CoEs and held shape provide the requisite thrust to these emerging fields.

(Rita Menon)

Place: New Delhi

Dated: August 16th, 2011

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1. Introduction

In 2007, Prime Minister Dr. Manmohan Singh announced the Technology Mission on Technical Textiles under the XI Five Year Plan. The mission has been established to address the "major constraints for improving production and consumption of technical textiles".

In 2008-09, four Centres of Excellence (COEs) were set up to catalyze industry support and build capacity in the area of Geotech (geo textiles used in civil engineering applications), Protech (personal and property protective clothing), Meditech (medical textiles) and Agrotech (specialized agriculture use). Each of these COEs was setup with an initial outlay of Rs 11 crores from the Central Government.

In 2010 a fund outlay of Rs 200 crores was announced to support the Mission for a period of five years (till 2014-15). As part of this, four new COEs have been announced: two COEs to focus on Indutech (industrial textiles) and Sportech (sports related); and two COEs to build national expertise in processes based on Nonwovens and Composites.

This compendium lists out the activities being undertaken by the COEs[1] and also provides insight into the additional initiatives planned at these centres.

About Technical Textiles

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

Technical textiles are used individually or as a component/part of another product to enhance its functional properties. The examples of technical textiles used individually to satisfy specific functions are fire retardant fabric for uniforms of firemen, coated fabric as awnings, airbags, carpets etc. The examples of technical textiles as a component or part of another product are tyre cord fabrics in tyres, interlining in shirt collars, webbings in seat belts, etc. Technical textiles are also used as accessories in processes to manufacture other products like filter fabric in chemical and food industries or paper maker felt in paper mills.

Technical textiles sector is a knowledge based research oriented industry and has been slowly but steadily gaining ground due to functional requirements viz. facets such as health and safety, cost effectiveness, durability, high strength, light weight, versatility, customization, user friendliness, eco friendliness, logistical convenience etc.

Different kinds of Technical Textiles

Agrotech

Agrotextiles are Special textiles that are manufactured for agricultural applications. These textile structures are used as controlling environment for plants/animals in applications like Agriculture, Horticulture, Animal husbandry, fisheries and forestry.

Examples of Agrotech technical textiles include shade-nets, mulch-mats, crop-covers, anti-hail nets and bird protection nets, fishing nets, pond lining, packing sacks and wrappers, cut grass collection bags, underlay fabrics, udder support nets, super Absorbent polymer mats, etc.

Agrotech consumption in India in 2012-2013 is valued at Rs. 742 crore amounting to a quantity of 33,390 MT. The fishing nets constitute over 90% of the Agrotech technical textiles.

Buildtech

Buildtech segment comprises of textiles or composite materials used in the construction of permanent and temporary buildings as well as structures.

The products covered under Buildtech include architectural membranes, hoardings and signages, cotton canvas tarpaulins, HDPE tarpaulins, awnings and canopies, scaffolding nets, floor & wall coverings, etc.

Domestic consumption of buildtech has been estimated at Rs 1,726 crore. Consumption of HDPE tarpaulins is estimated at Rs 650 crore, accounting for around 40% of the total segment.

Clothtech

Clothtech segment of technical textiles mainly comprises of textile components used for specific functional applications in garments and shoes. These components are largely hidden e.g. interlinings in shirts, sewing threads, shoe laces, labels, hook and loop fasteners (Velcro), etc. Fabrics like umbrella cloth are also classified under the Clothtech segment.

Clothtech consumption is estimated at Rs 6,570 crore. Sewing threads alone account for around 60% of the technical textiles consumption under Clothtech followed by labels with around 19% share.

Geotech

Geotech segment comprises of products used in Geotechnical applications pertaining to soil, rock, earth etc. Application areas include Civil Engineering (roads and pavements, slope stabilization and embankment protection, tunnels, rail-track bed stabilization, ground stabilization and drainage, etc.), Marine Engineering (soil erosion control and embankment protection, breakwaters) and Environmental Engineering (landfills and waste management).

Current Geotextiles Market in India (Imports and domestic production) is around Rs 272 Crore, comprising imports of an estimated Rs 105 Crore and domestic production of around Rs 167 Crore.

Hometech

Hometech segment comprises textiles used in the domestic environment-interior decoration and furniture, carpeting, protection against the sun, cushion materials, fireproofing, floor and wall coverings, textile reinforced structures/fittings, filter products for vacuum cleaners.

Examples include mattress and pillow components, fiberfil, carpet backing cloth, stuff toys, blinds, HVAC filters, filter cloth for vacuum cleaners, nonwoven wipes, mosquito nets, etc.

Consumption under Hometech is estimated at around Rs 3,200 crore. Fiberfil and pillow and mattress components together constitute over 50% of the technical textile usage.

Indutech

Indutech includes textile products used in the manufacturing sector such as conveyor belts (TT component), drive belts (TT component), decatising cloth, bolting cloth, AGM glass battery separators, coated abrasives (TT component), ropes and cordages, composites (technical textiles component), paper making fabrics, filtration products, etc.

Technical textiles consumption under Indutech in India is estimated at around Rs 2,326 crore. Printed circuit boards, AGM battery separators and other applications of fibre glass constitute around one-third of the technical textiles usage.

Meditech

Combination of textile technology and medical sciences has resulted into a new field called medical textiles. Medical textile is one of the most rapidly expanding sectors in the technical textile market.

Medical textile products can be classified as:

- Healthcare and hygiene products: Surgical clothings, Covers, Beddings, Sanitary napkins, Baby diapers, Adult incontinence
- Non-implantable materials: Bandages, Wound care, Plasters, Gauze
- Implantable materials: Sutures, Soft tissue implants, Hard tissue implants, Cardio vascular implants
- Extra corporeal materials: Artificial kidney, Artificial Liver, Mechanical Lungs
- Meditech consumption is estimated at Rs 3388 crore. Surgical dressing alone accounts for over 50% of the total.

Mobiltech

Mobiltech is used in the construction of automobiles, railways, ships, aircraft and space craft. The Mobiltech products can be broadly classified into two categories-visible components and concealed components. The visible components include seat upholstery, carpets, seat belts, headliners, airbags, etc. The concealed components include Noise Vibration and Harness (NVH) components, tyre cords, liners, etc.

Technical textiles consumption under Mobiltech is estimated at Rs 3,158 crore. Nylon tyre cord accounts for over 60% of the total technical textile consumption in the segment followed by seat upholstery / fabric with a share of around 13%. Insulation felts.

Oekotech

Oekotech or Ecotech segment refers to use of technical textiles in Environmental Engineering. The primary segment in this is landfill waste management which refers to the use of Geosynthetic products to secure landfills against leakage of municipal or hazardous waste. Other areas include secondary protection in chemical/oil industries.

The current market size of Oekotech segment is estimated at Rs 68 Crore. The market is expected to grow based on spends on municipal waste disposal in accordance with Municipal Solid Wastes (Management & Handling) Rules, 2000, as well as greater awareness and government activity on Hazardous Waste in accordance with Supreme Court Guidelines.

Packtech

Packtech includes several flexible packaging materials used for industrial, agricultural, consumer and other goods. It ranges from synthetic bags used for industrial packaging to jute sacks used for packing food grains. Other packtech applications include: Polyolefin woven sacks, FIBC, Leno bags, wrapping fabric, jute hessian and sacks (including Food grade jute bags), soft luggage products,tea-bags, etc.

Packtech consumption is estimated at Rs 14,067 crore. Woven sacks (excluding FIBC) account for around 50% of the technical textiles consumption under Packtech followed by Jute hessian and sacks with around 30% share.

Protech

Protech are used in the manufacture of various protective clothing for personnel working in hazardous environment. The protective clothing includes garments and related paraphernalia for protection from harmful chemical environment, extreme temperature environments, low visibility, ballistic protection, bullet-proof jackets, fire retardant apparels/ furnishings, radiation protection textile, high visibility clothing, industrial gloves, high altitude clothing, etc.

Indian Defence Forces with a total strength of around 1.5 million individuals comprising the army, navy and air force, is one of the largest consumers of protective textiles.

Sportech

Special clothing and sports equipment to enhance **protection, comfort** and **performance.**

Sportech comprises of technical textiles used in sports and leisure, which is broadly classified in three categories.

Sportswear – Apparel with performance enhancement characteristics such as moisture management, comfort, elastomeric, soil guard, anti-microbial – sports shirt, athletic wear, sport shoes, exercise wear, sport jerseys, gloves, etc.

Sports Goods – Active sport items for the specific sport like inflatable balls for football, volleyball, Rugby ball, Hockey sticks, Golf club, etc.

Sport accessories – Games paraphernalia like astro-turfs, nets, rings, etc to provide requisite playing conditions.

It is predicted that expenditure on sports will grow with a CAGR of 8.9%, from US$ 1 billion in 2005 to US$ 6 billion in 2025.

The world market for technical textiles was estimated to be around 19.68 million tonnes with a value of approx Rs 50,000 crores (US$ 107 billion) during 2005 and the drivers for future growth of this industry are expected to be Asian countries like China and India.

In the global scenario, Mobiltech, Indutech and Sportech are predominant segments which collectively constitute about 56 percent of total global consumption of technical textiles.

While overall this industry is import intensive, some of the products are also exported - most of these are commodity products like tarpaulin, jute carpet backing, stuffed toys, surgical dressing, sutures, sports composites, etc. With increase in indigenous production, there is excellent potential for export of technical textiles particularly in the SAARC countries, where this industry is not well developed and depends on import to meet their domestic demand.

About Technology Mission on Technical Textiles

The Technology Mission on Technical Textiles (TMTT) is composed of two mini-missions and the components under each are outlined below:

Overview of Mini-Mission I

The creation and expansion of the COEs is being undertaken under the aegis of Mini-mission I. The mission document outlines the essential features to be created at the Centres of Excellence and the same are summarized below:

1. Facilities for testing and evaluation of products in identified segments of technical textiles with national/ international accreditation and collaboration with foreign institutes/ laboratories. The testing facilities shall cater to the requirement of testing the final product as also the fibre, yarn, fabrics and other elements that go into the final product. The goal is to ensure that the COEs are duly accredited by NABL and other reputed international institutes so that their test results are accepted in the international market.

2. Resource centre with IT infrastructure that provides knowledge and information on the technical textiles. Each COE shall maintain and develop information related to material, books, specifications, directives, etc.
3. Facilities for indigenous development of prototypes. Pilot plant facilities are being created for development of prototypes / technology which shall be transferred to the industry after standardization and optimization of the production process.
4. Facilities for training of core personnel and regular training of personnel from the technical textile industry. COEs will impart training to textile technologists, academicians, scientists, etc. from TRAs, institutes and industry to develop a set of core training professionals.
5. Knowledge sharing with stakeholders and end users such as farmers, civil engineers, architects, medical practitioners, government agencies, etc.
6. Incubation centres where each of the COEs will provide necessary facilities to entrepreneurs for testing new ideas and technologies.
7. Support BIS in setting up standards that are at par with global level. This is especially critical given that technical textiles are functional in nature and yet Indian standards and specifications are not available for most technical textile products.

The Centres of Excellence covered under Mini-mission I include 6 product-focused COEs and 2 process focused COEs.

Product Focused Centres of Excellence

Agrotech	Lead: Synthetic & Art Silk Mills Research Association (SASMIRA), Mumbai Partners: Man-made Textile Research Association (MANTRA), Surat Navsari Agriculture University, Navsari Knowledge partner: Indian Institute of Technology (IIT), Delhi
Geotech	Lead: Bombay Textile Research Association (BTRA) , Mumbai Partner: Ahmedabad Textile Industry's Research Association (ATIRA), Ahmedabad
Indutech *	PSG College of Technology, Coimbatore
Meditech	Lead: South India Textile Research Association (SITRA), Coimbatore Partner: AC College of Technology, Chennai
Protech	Lead: Northern India Textile Research Association (NITRA), Ghaziabad Partner: Indian Institute of Technology (IIT), Delhi
Sportech*	Lead: Wool Research Association, Thane Partners: Veermata Jeejabai Technological Institute (VJTI), Mumbai

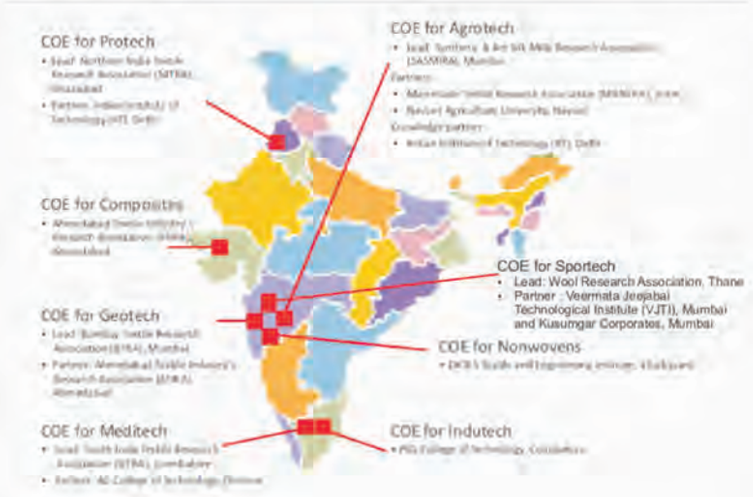
Process Focused Centres of Excellence

Composites*	Ahmedabad Textile Industry's Research Association (ATIRA), Ahmedabad
Nonwovens*	D.K.T.E. Society's Textile & Engineering Institute, Ichalkaranji

*Recently launched COEs

For each of the 4 existing COEs, fund support to the tune of Rs. 25 crores has been allocated (Rs. 11 crores has already been provided prior to the launch of the TMTT). The balance Rs. 14 crores is currently under disbursement to further augment the capacity of these COEs.

For each of the recently launched COEs, Rs. 25 crores is being provided (Rs. 20 crores for capital equipments for lab, pilot plant, prototype development, etc. Rs. 2 crores for developing training facilities, etc. and Rs. 3 crores towards recurring expenditure for appointment of consultants/scientists/technologists for an initial period of 3 years).



Overview of Mini-Mission II

Mini-Mission-II (with a total outlay of Rs. 44 crores) primarily focuses on the market development activities for promotion of technical textiles in the domestic and export markets. The mission aims to:

1. Generate 30 business start-up projects. Rs. 3 crore fund allocation has been made to support entrepreneurial investment in this field.
2. Organize 52 workshops. A Rs. 5 crore fund allocation has been made to support this effort.
3. Catalyze social compliance through standardization of regulatory measures. Some of the technical textile products require mandatory prescriptions for their use. Through Mini-mission II, consultants will be engaged to identify the needed regulatory changes required along with international best practices as also to define the strategy to facilitate such changes in rules and regulation. A Rs. 5 crore fund allocation has been made to support this effort.
4. Provide market development support through 30 buyer-seller meetings. The aim is to support bulk and/or institutional transactions nationally as well as internationally. Nationally, technical textiles are predominantly consumed by institutional consumers like defence, railways, NHAI, etc. In its report on the Baseline Survey of Technical Textile Industry, ICRA Management Consultancy Services (IMaCS) has estimated the current consumption of technical textiles from defence, hospital and railways to be around Rs. 1570 crores. A Rs. 15 crore fund allocation has been made to support this activity.
5. Support 50 manufacturing units for export assistance. A Rs. 5 crore allocation has been made to support this activity.
6. Support 20 contract research projects through IITs, TRAs and Textile institutes. Given that technical textiles is a high technology area where most of the material is imported, there is a need to promote indigenous development, for which R&D is a pre-requisite. A Rs. 11 crore allocation has been made to support this effort.

Enterprises wishing to engage in the above areas and work with the COEs can learn more about the operational mechanics and requirements in the Technology Mission on Technical Textiles 2010-11 to 2014-15. A soft copy of these documents is available on the site for Technical Textiles being run by the Office of the Textile Commissioner, Government of India: http://technotex.gov.in/.

2. Snapshot of COEs

In this section a snapshot of key objectives and updates on the activities of the various COEs is provided. Comprehensive information on each of the COEs is provided separately in subsequent sections.

COE on Agrotech

The Centre of Excellence for Agrotextiles has been assigned to The Synthetic and Art Silk Mills' Research Association (SASMIRA) as the lead agency jointly with other agencies viz., The Man-made Textiles Research Association (MANTRA), Surat and Navsari Agricultural University (NAU), Navsari.

The vision of the COE:
"To become a world class leading service driven national center for technical textile with international accreditation to serve the industry in general and agriculture sector in particular"

The mission of the COE:

- Creating awareness regarding agrotextiles products amongst agriculturists
- To assist the industry for entrepreneurship in the field of agrotextiles
- To provide training to the potential agrotextile manufacturers and users.
- To create state-of-the-art testing and certification facilities for agrotextile products
- To achieve self –reliance for the Centre of Excellence
- To develop and indigenise cost-effective agrotextile products
- To help the agricultural sector mainly to attain
    - Increased productivity by protection of crops
    - Early harvesting
    - Improved means of controlled irrigation
    - Conservation of natural resource

Under the Centre of Excellence, the following facilities have been created

- Demonstration Pilot Plant facilities
- Accredited Testing facilities
- Information center for Agrotextiles
- Training Center for Agrotextiles
- Prototype development
- Incubation center

The SASMIRA laboratory for Centre of Excellence Agrotextiles is accredited Nationally by National Accreditation Board for Testing and Calibration Laboratories (NABL, India) and Internationally by American Association of Laboratory Accreditation (A2LA, USA) in accordance with the international standard ISO/IEC 17025 – 2005 for Physical and Chemical and Biological evaluation of textiles. MANTRA has acquired NABL Accreditation as per ISO/IEC 17025 – 2005

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The centre assists the manufacturer in development of standard agrotextile products and users in adopting the agrotextile products in the most scientific way. This is facilitated through specific training workshops, online training and demonstration at field. Also customized courses are made available to address the specific needs of the industry.

List of standards and specifications formulated at the Agrotech COE

1. Glossary of Agrotextiles – finalized and accepted by BIS. Under publication
2. Specification for 50 % shade nets for horticulture applications – Printed under IS 16008:2005
3. Specification for woven ground covers – Printed under IS 16008:2005
4. Specification for 75 % shade nets for horticulture applications – Printed under IS 16008:2005
5. Specification for 90 % shade nets for horticulture applications – Printed under IS 16008:2005

Additional details are in Section 3.

COE on Geotextiles

The Centre of Excellence on Geotech was launched in 2008 with Bombay Textile Research Association (BTRA) as the lead partner duly supported by Ahmedabad Textile Industry's Research Association (ATIRA).

Major Technical Textile Testing Equipment Installed at the COEs

- Agrotextile light shading percentage tester
- Air permeability Tester
- Air Permeability Tester (WIRA)
- Apparent Opening Size Analyzer
- ATLAS Weather -o-meter
- Atomic Absorption Spectrophotometer (AAS)
- Ball Burst Tester
- Banana fibre extractor
- Brush Pilling Tester (SDL-ATLAS)
- BTRA Thickness Tester
- Bundesmann Water repellency Tester
- Bursting strength tester
- Carbon Black Content Analyser
- Carbon Black Dispersion Tester
- Carle Zeiss microscope
- CBR puncture test with accessories
- Cold Impact Chamber
- Compression tester
- Computer Colour Matching System (reflective & transmission)
- Cone Drop Tester
- Constant Tension Transport (CTT)
- Contact Heat Tester
- Convective heat Tester
- Creep Tester
- CSI Abrasion Tester
- Deterioration of Smoke Visibility Tester
- Differential Scanning Calorimeter (DSC)
- Digital Bursting StrengthTester
- Digital Density Balance
- Digital Platform Scale
- Direct Shear Box : For Friction Properties Analysis
- Dynamic Fatigue Tester
- Dynamic Impact Tester
- Electronic crock meter
- Electrostatic tester
- Endurance Test for Hook & Loop Fastener
- ESCR
- Film Thickness Tester
- Flammability tester
- Flushability Tester for Non-Woven Products
- Fogging Tester
- Fourier Transform Infra-red Spectroscopy (FTIR)
- Gas Chromatography and Mass Spectrum Detector (GC-MS)
- Gas/Vapor Permeameter
- Global UV 200
- Gravimetric Absorption Test System (GATS)
- High Performance Liquid Chromatography (HPLC)
- High Performance Thin Layer Chromatography (HPTLC)
- High pressure air-permeability tester
- High Visibility clothing testing equipment
- Hirox Advanced 3 D Video Microscope
- Horizontal Flammability Tester
- Humidity and temperature control Chamber
- Hydrostatic pressure head tester
- ICI Mace Snag Tester SDL-ATLAS
- Inclined Automatic Flammability Tester
- Index Puncture Test Apparatus (mechanical)
- Index Puncture Test Apparatus (Pneumatic)
- Instron make UTM, 50 KN
- Instrument for Run test
- Lab. Coating Machine
- Limited Oxygen Index Tester
- Liquid Absorbency Tester & Liquid Absorbency Kit
- Liquid Barrier Test System
- Liquid Wicking Rate Tester Kit
- Lister AC & Wet Back
- Low Stress Property Kawabata KES Auto System
- Martindale Abrasion Cum Pilling tester (SDL)
- Mechanical pre-treatment device for metalized material
- Melt Flow Index Tester
- Mettler Balance
- Microbial resistance tester
- Microscope & Microtome (Zeiss)
- Microwave Digestion Unit
- Moisture analyzer
- Moisture Balance
- Moisture Management Tester
- Molten metal splash Tester
- Particle Size Analyser
- Peel Bond Tester
- Pneumatic press (with cutting dies)
- Polarised Microscope
- Porometer
- Profile Projector
- Pull Out Tester
- Puncher tester
- QUV spray tester
- Radiant Heat transmission tester
- Rapid oil extraction apparatus
- Reciprocating Movement of Slider under Load Tester for Zippers
- Resistance to Heat under Load Tester for Zipper
- Rotary crock meter
- SDL Thickness Tester
- Seam Fatigue Tester
- Shear Tester
- Sieve Shaker
- Spray Tester-Water Repellency
- Surface Resistance Tester (Rothschild static Voltmeter)
- Sweating Guarded Hot Plate
- T.G.A. Instrument
- Taber abrasion tester
- Tear strength Tester (Textest)
- Temperature Chamber for Ball Burst Tester
- Tensile Testing Machine
- Tension creep
- Thermal Conductivity Tester
- Thermal insulation tester TIV
- Thermal Oxidation Tester
- Thermolabo-Thermal Property Measuring Instrument
- Thickness Gauge
- Torsion Balance
- Toxicity Tester
- Universal Tensile Testing M/C (SDL)
- Universal wear tester
- Uster Tensorapid -4
- UV Weatherometer
- UV-Visible Spectrophotometer
- Vertical and horizontal flame chamber
- Vertical Flammability Tester
- Vibrodyne
- Vibroscope & Vibrodyne (Lenzing)
- Vibrotex (Lenzing)
- Washing and dry cleaning cylinder
- Water Cooled Xenon Tester
- Water permeability in the plane of the geosynthetic (with load)
- Water Permeability Perpendicular to the plane of the geosynthetic (without load, falling head)
- Water Permeability Tester
- Water Permeability: perpendicular to the plane of the geosynthetic (with load)
- Water Vapour Transmission Rate Tester
- Weatherometer
- Wet Barrier Tester
- Wind blocking percentage tester
- Wyzenbeek Abrasion tester

The above list does not include testing equipment proposed to be bought by the COEs; details on the same are mentioned in the sections on the individual COEs.

In the past two decades, many applications of geo-synthetics have proved their value in civil engineering projects. This new class of material has added an entirely new dimension to the world of geotechnical engineering. Geosynthetic materials like Geotextiles, Geogrids, Geonets, Geocell, and Geomembranes are used in various civil engineering activities.

The Centre of Excellence for Geotech at BTRA has been established to undertake the following:

- To create awareness for the use of geosynthetic products and to facilitate the evaluation and development of geosynthetics
- To encourage the entrepreneurs to develop geosynthetics indigenously by providing know how and developing samples at BTRA pilot plant

BTRA has setup a new Geotech Laboratory with all testing facilities to test Geotextiles, Geomembranes, Geocomposites, Gabions, Geosynthetic Clay Liner, Geogrids, Prefabricated Vertical Drain etc. BTRA is also strengthening its information resources on Geotech by procuring various books and international test methods such as ASTM, INDA, EDANA, ISO, etc. The Geotech laboratory at BTRA is accredited per the following:

- GAI-LAP Accreditation of Geosynthetics Institute, USA
- ISO/IEC-17025:2005

R&D projects undertaken/under progress in the field at Geotech COE are:

1. Development of geotextile (natural & synthetic fibres) for various clients (completed).
2. Development of filters for various clients (completed).
3. Design & development of creep rupture tester as per ASTM D 5262 (under progress).
4. Development of protective nonwoven (completed).
5. Development of woven geotextile (under progress).

BTRA is going to set up a separate testing laboratory for soil, aggregates & asphalt.

Additional details are in Section 4.

COE on Meditech

The Centre of Excellence on Medical Textiles is being led by the South India Textile Research Association, popularly known as "SITRA".

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SITRA has formulated standards for the following Meditech related products:

1. Surgical gowns- Disposable
2. Surgical drape - Disposable
3. Surgical face mask - Disposable
4. Cellulose wadding
5. Vapor permeable water proof plastic wound dressings
6. Non-woven gauze bandage
7. Paraffin gauze dressings
8. Knitted viscose primary dressings
9. Perforated film absorbent dressings
10. Tubular bandages
11. Orthopaedic stockinette

In addition, the following prototypes have been developed by SITRA:

1. Woven surgical gowns treated with nano finishes
2. Hernia mesh
3. Heart valve fabric
4. Functional spacer fabrics for medical inlays in orthopaedic shoes
5. Woven arterial prosthetic graft
6. Clinical heart patch

7. Bandages using bamboo fibres
8. Ankle support
9. Development of 4-layered Face-mask
10. Development of 8-layered mopping pad
11. Development of Face Mask with Eye-Guard
12. Face Mask with Nylon 6-nanomembrane

Additional details are in section 5

COE on Protech

The Project Evaluation Committee constituted by the Ministry of Textiles, Government of India designated the Northern India Textile Research Association (NITRA) and Indian Institute of Technology, New Delhi with NITRA as lead partner as Centre of Excellence for Protective Textiles.

NITRA has successfully completed following projects on Technical Textiles:

1. Development of fire resistant equipment
2. Development of industrial fabrics
3. Protective clothing from jute
4. Development of antimicrobial fabric
5. Development of UV resistant fabric
6. Protection against pesticides
7. Development of cut resistant & abrasion resistant protective textile by using composite metallic yarn
8. Developing shield of corn fabrics for enhancing the protection from flame
9. Developing armor using Hi-Modulus Polyethylene (HMPE) fibre
10. Development of water purification device using textile material for military and paramilitary personnel
11. Development of protective material from nylon 66 and corn
12. Development of flame resistant and chemical resistant laboratory coat/apron
13. Selection of combat uniform cloth on the basis of comfort, wear and safety properties

Following products have been developed at NITRA:

1. NYCO fabric for Paramilitary and Military combat uniforms
2. Personal protective textile using novel fibre
3. Functional fabric to provide bacterial & ultraviolet protection to the skin (bamboo)
4. Extra soft knitted fabric for inner wear / kids wear by using 'High Performance Modal Fibre'
5. Stab Resistant Fabric from Dyneema - Hi-Modulus Polyethylene (HMPE)
6. Cut Resistant Fabric using Composite Metallic Yarn
7. Cut resistant glove from Nylon/Steel composite Metallic Yarn
8. Cut resistant glove from polyester/Steel composite Metallic
9. Cut resistant glove from Cotton/Steel composite Metallic Yarn

With respect to prototypes, the following instruments have been developed:

- Flammability Tester (As per BS 5438)
- Flammability Tester (As per IS 11871 Method A)
- Smoke visibility test apparatus (As per UIC code 562 – 2 Appendix 15)
- Fire resistant test apparatus (As per UIC code 562 – 2 Appendix 5 and 12)
- Limiting Oxygen Index Tester
- Toxicity Tester
- Fabric Hand Tester
- Dimensional Stability to Dry Heat Tester
- Soil release efficiency Tester

NITRA has submitted a draft white paper on 'Formulation of Regulations in respect of Safety Industrial work-wear (Heat and Flame)' to the Government of India suggesting to amend 16 industrial acts to ensure workers' safety while working in high risk environment.

Additional details are in Section 6

COE on Composites

With regards to Composites, ATIRA's stated objective is to create a Centre of Excellence (COE) for development of advanced composites applications through advanced process in order to achieve weight reduction, high mechanical properties and cost competitiveness. Furthermore the goal is also to enhance the knowledge base in composites through research, development and training.

The following projects are being undertaken at ATIRA:

- SMC Manufacturing using Jute as the major reinforcing fibre & Compression molding.
  (sanctioned by National Jute Board, Kolkata)
- Improving properties of Jute fibres for use in Composites as Automotive parts.
  (under consideration of National Jute Board, Kolkata)

In addition to the COE for Composites, ATIRA is also establishing COEs for Geo-Textiles and Nano web Technology with the support of the Gujarat State Government.

Additional details on the Composite COE are provided in Section 7.

COE on Indutech

PSG College of Technology houses the recently announced Centre of Excellence on Industrial Textiles. The COE on Indutech was sanctioned in March 2011 and the process for setting up of infrastructure facilities is in progress.

Some of the following projects are in progress related to Industrial Textiles

- Development of Natural fiber nonwovens for Acoustic Applications
- Development of Jute/Wool blend nonwovens
- Development of natural fiber nonwovens for application as car interiors for noise control
- Bamboo blended nonwovens for automobile interiors
- Utilisation of chicken feathers for the development of nonwovens and value added products
- Development of natural fiber nonwovens for application as car interiors
- Production of an hydrophobic oleophilic kapok nonwoven fabric for its potential application
- Analysis of Natural Nonwoven Geo Textiles used in Erosion control.
- Design & Development of Nonwoven Products using recycled fibers
- Nonwoven Textiles as Health Care products
- Development of odor free Antimicrobial hospital linens
- Production and properties of Nonwovens using comber noils.
- Design and Development of Home Textiles using nonwoven fabrics.
- Design and Development of Absorbent Products using Rayon Filament waste.
- Design and Development of Fuel Filter
- Development of pp fiber reinforced concrete Structures
- Development of Functional Gadgets for Automotive Textiles.
- Development of Specialty finishes to fibers.
- Development of Scrubs using natural fibers

Additional details on the plans for the Indutech COE are presented in Section 8.

COE on Non-wovens

The D.K.T.E. Society's Textile & Engineering Institute based in Ichalkaranji has been designated as Center of Excellence in Nonwovens by the Ministry of Textiles, Government of India.

The COE in the process of procuring state of art machineries for research, incubation, provide technical know-how and hands on training for industrial personal.

Activities of COE

- Research & Development
- Training
- Testing
- Consultancy
- Technology business incubation
- Rapid Prototyping
- Library & Information centre
- Liasioning
- Survey report

The COE is still being set-up and DKTE will be building upon the following R&D activities that are in progress / have been completed:

1. Study of performance characteristics of sugarcane fibre composites.
2. Studies in wound care & bandages
3. Studies in Moisture Management in textiles
4. Application of Nanotechnology in Textile Finishing
5. Studies in application of super absorbent polymers on textiles.
6. Coating of nonwoven materials for specialty applications.
7. Studies in surgical non-woven Gown.
8. Natural Fibres as Reinforced material in false ceiling.
9. Studies in nonwoven fabrics for water filtration.
10. Studies in nonwoven air filter fabrics.
11. Microencapsulation technique for technical textiles.
12. Application of Chicken Feather.
13. Studies on fiber reinforced concrete.

For details on the equipment being procured by D.K.T.E. Society's Textile & Engineering Institute as well as other aspects of the COE, please refer to Section 9.

COE on Sportech

Wool Research Association has been designated as Centre of Excellence for Sports Textiles and allied products as lead partner duly supported by consortium partners viz. Veermata Jeejabai Technological Institute (VJTI), Mumbai and Kusumgar Corporates, Mumbai.

Following R&D Projects related to Technical Textiles and Sport Textiles are Undertaken/Under Progress at WRA:

1. Highly engineered friction spun yarns for brake liners & clutch facing suitable for light weight to heavy weight vehicles.
2. Composite yarns made of glass, kynol and carbon fibers for belt cloth for mines.
3. Non asbestos multi component Heterogeneous yarns used in friction component for industry.
4. Filter cartridges made of cotton, PP, Polyester, Glass & Nylon for water and chemical filtrations
5. Multi layered fabrics (high tensile fabrics) for belting
6. Endless belts (conveyer belts) for carrying high tensile loads
7. Non asbestos abrasive yarns for braids used as insulating material in lifting pumps.
8. Kevlar/basofil bi-component yarns for protective fire fighting suits.
9. 100% carbon woven fabrics for high heat resistance applications up to 1200°C.
10. Thermal fabrics for protection against cold weather.
11. Kevlar and FR viscose yarns for high altitude pilot suits.
12. Heavy duty fabrics for hand gloves
13. Flame retardant yarns and fabrics made of wool and kanecaron (modacrylic fibers).
14. Heat resistant fabrics for fire curtains made of ceramic/ glass/ metal wire.
15. Itch proof woollens for various use including sportech by using Plasma and enzyme treatment
16. Wool Based flame retardant fabrics
17. Synthesis of Moth Resist Dyes for woollen products including sportech
18. To develop a smart indigenous sleeping bag with heating property
19. Design and development of High Performance, Multifunctional, Protective Sportswear for various sports
20. Development of Waterproof Breathable Sportswear with desired functional properties by eco-friendly water based coating techniques
21. Development of thermal responsive high altitude multilayer protective clothing made principally of angora fiber

Additional details are on Sportech 10

Status of Established COEs

3. COE on Agrotech

Lead: Synthetic and Art Silk Mills' Research Association (SASMIRA)

Background And Information Of Parent Organization(s)

The Centre of Excellence for Agrotextiles has been assigned to The Synthetic and Art Silk Mills' Research Association (SASMIRA) as the lead agency duly supported by other agencies viz., The Man-made Textiles Research Association (MANTRA), Surat and Navsari Agricultural University (NAU), Navsari. The establishment and functioning of this centre has been initiated under the MOU signed on 25th August, 2008 with the Office of the Textile Commissioner.

Synthetic and Art Silk Mills' Research Association (SASMIRA)

Conceived after independence, SASMIRA, a co-operative endeavor in textile research, has become a reality through joint efforts of numerous institutions and dedicated individuals. At that time silk and art silk industry was composed of large number of small units and the industry pioneers mooted the proposal for creating a co-operative research organization. This proposal was supported by the Council of Scientific and Industrial Research (CSIR) and other Government agencies and led to the establishment of Silk and Art Silk Mills' Research Association, since rechristened as SASMIRA. SASMIRA completed its fifty years of existence and industrial excellence in 2000, coinciding with the new millennium.

SASMIRA is engaged in multifarious activities with the prime objective of rendering scientific and technical assistance to the textile industry and allied sectors. Various activities undertaken by SASMIRA are summarized below:

1. Research & Development
2. Human Resource Development
3. Testing and Evaluation of textiles and allied substrates
4. Technical services and consultancy
5. Instrumentation
6. Publication
7. Powerloom Service Centres, Bhiwandi

SASMIRA has been designated as the lead agency for Centre of Excellence for Agrotextiles in the country. On this front, the institute has established facilities for demonstration, testing and evaluation, training of manpower and information sourcing on agrotextiles.

Man-Made Textile Research Association, MANTRA, Surat

MANTRA, established in 1981, is one of the eight national level Textiles Research Associations (TRAs) and one of the leading TRAs in man-made fibres, linked to the Ministry of Textiles, Government of India, and recognized as SIRO by the Department of Scientific & Industrial Research, Ministry of Science & Technology, Government of India. MANTRA is registered under Bombay Public Trust Act, 1950, and Societies Registration Act, 1860.

Besides R&D, environmental audit, energy audit, consultancy and HRD activities, MANTRA also undertakes testing and technical services. MANTRA has a full-fledged modernized physical testing laboratory, chemical testing laboratory, eco-laboratory, environmental affairs laboratory, analytical testing laboratory and energy audit laboratory. MANTRA is equipped with state-of-the art testing facilities and offers testing of fibres, yarns, fabrics, dyes and chemicals, eco parameters, water and waste water, air, thermic oil, coal, etc.

Navsari Agricultural University, NAU, Navsari

Navsari campus was started with establishment of N.M. College of Agriculture way back in 1965. The campus gained the status of a separate agricultural university on May 1, 2004. The headquarters of Navsari Agricultural University is at Navsari - the University's 13 research stations work in the area of soil and water management, biotechnology, plant protection, Agro techniques, post harvest technology and food quality research with respect to various crops viz., cotton, paddy, sugarcane, sorghum, pigeon pea, black gram, niger, smaller millets, fruit crops (mango, sapota and banana), etc.

The University has three major activities namely Teaching (offering UG and PG degree including Ph.D in various subjects under three faculties i.e. Agriculture, Horticulture and Forestry and PG degree in Agri. Business Management), Research and Extension Education.

Infrastructure and Facilities

Testing Instruments at the COE

The established testing facility under Centre of Excellence is nationally and internationally accredited and is available to manufacturers and users of agrotextile products. This helps the users and manufacturers to ascertain the product quality and specifications.

The list of testing equipment added under the Centre of Excellence at SASMIRA, Mumbai is provided below:

Sr. No.	Equipment
1.	Water Permeability /permittivity –cross plane
2.	High pressure air-permeability tester
3.	Tension creep
4.	CBR puncture test with accessories
5.	Wind blocking percentage
6.	Lux Meter
7.	Thermal Oxidation Test (Oven test,-400C to1000C)
8.	Thermal insulation tester – TIV
9.	Damage due to Flexing
10.	Laminar Air Flow
11.	Colony Counter
12.	Colorimeter
13.	Refrigerator
14.	Autoclave
15.	Centrifuge
16.	Incubator
17.	Vortex Mixer
18.	Shaking Incubator
19.	Magnetic Stirrer
20.	Differential Scanning Calorimeter & Thermal Gravimetric Analyser

Sr. No.	Equipment
21.	Torsion Balance
22.	pH Meter
23.	Analytical Balance
24.	Water Bath Shaker
25.	Muffle Furnace
26.	Wascator
27.	Sublimation Fastness Tester
28.	Vertical Padding Mangle
29.	HTHP-GN Dyeing m/c
30.	Infra Color Dyeing m/c
31.	Lab Steamer
32.	Drying, Curing & Setting Chamber
33.	High speed stirrer
34.	Centrifuge
35.	Weatherometer
36.	High Performance Thin Layer Chromatography
37.	Atomic Absorption Spectroscopy
38.	Limiting oxygen tester
39.	Autoflammability tester
40.	High Performance Liquid Chromatography
41.	Scanning Electron Microscope

The list of testing equipments added under the Centre of Excellence at MANTRA, Surat is as follows:

Sr. No.	Equipment
1.	Vibrodyne
2.	Moist Heat Hydrolysis Tester
3.	Film Thickness Tester
4.	Shear Tester
5.	Forced Air Laboratory Oven
6.	Water Vapour Transmission Tester
7.	Cold Crack Tester
8.	Light Fastness Testing Instrument
9.	CBR puncture test

10.	Apparent opening size of geotextile
11.	Taber abrasion tester
12.	Rheometer
13.	Contact angle meter
14.	Portable spectrophotometer
15.	Photosynthetic apparatus
16.	Light scattering spectrophotometer
17.	Gas Chromatography Mass Spectrophotometer

Images of Testing Equipment at the COE

Differential Scanning Calorimeter (DSC)

CBR Puncture Test with Accessories

Thermal Insulation Tester TIV

Polarised Microscope

Fourier Transformation Infra Red Spectrophotometer

Agrotextile Light Shading Percentage Tester

High Pressure Air-Permeability Tester

Computer Colour Matching System (reflective & transmission)

Microbial Resistance Tester

Tension Creep

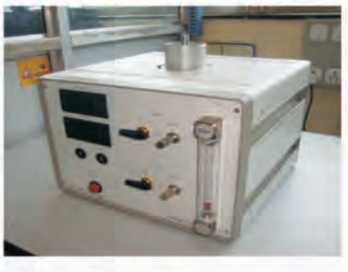
QUV Spray Tester

Electrostatic Tester

Atomic Absorption Spectroscopy

High Performance Liquid Chromatography

High Performance Thin Layer Chromatography



Limiting Oxygen Tester

Scanning Electron Microscope

Laboratory Drying, Condensation and Fixation ApparatusTest Parameters

Test Parameters

SASMIRA laboratory for Centre of Excellence Agrotextiles is accredited by National Accreditation Board for Testing and Calibration Laboratories (NABL) in accordance with the international standard ISO/IEC 17025 – 2005 for Physical, Chemical and Biological evaluation of textiles. Although, NABL accreditation has recognition by world laboratories, for domestic exporters American accreditation has been sought for the COE Agrotextiles. Hence, international accreditation has been attained from American Association for Laboratory Accreditation (A2LA), USA for Physical, Chemical and Microbiological testing of textiles and allied substrates.

Total Number of tests methods under National Accreditation: 119
Total Number of tests methods under International Accreditation: 127

MANTRA is in the process of acquiring NABL Accreditation under the guidance of the Textile Committee, Mumbai. Most of the preliminary work has been completed and they shall soon be sending in the application for NABL Accreditation.

Scope of Mechanical Test Parameters

	Mechanical Test Parameter	Test Method (s)	Testing Charges (excludes taxes) in Rs.
1.	Mass or weight per square metre of fabric	ASTM D 3776 ISO 7211-6 IS 1964	100
2.	Threads/unit length	ASTM D 3775 ISO 7211-2 IS 1963	125
3.	Yarn count	ASTM D 1059 ISO 7211-5 IS 3442	150
4.	Thickness	ASTM D 1777 IS 7702	125
5.	Stiffness	ASTM D 1388 Option A	200
6.	Tensile strength	ASTM D 5035 ISO 13934-1 IS 1969	350/500
7.	Grab strength	ASTM D 5034 ISO 13934-2 IS 1969	400
8.	Tear strength (woven) (Non-woven)	ASTM D 2261 ISO 13937-2 ASTM D 5733	350/500
9.	Air permeability	ASTM D 737 ISO 9237	350
10.	Puncture Resistance Index CBR Puncture	ASTM D 4833 ASTM D 6241 ISO 12236	500
11.	Bursting strength and bursting distension of fabrics: diaphragm method	ASTM D 3786 ISO 13938-2 IS 1966	250
12.	Martindale abrasion	ASTM D 4966 ISO 12947-1	400 for 10000 rubs
13.	Textiles-yarn-Determination of Breaking load and elongation at break of single strand	ASTM D 2256 IS 1670	325
14.	Determination of Length of woven fabrics	ASTM D 3773 ISO 22198 IS 1954	100
15.	Width of Fabric	ASTM D 3774 ISO 22198 IS 1954	100
16.	Determination of Linear density of yarns spun on cotton system	ASTM D 1907 ISO 2060 IS 1315 IS 7703 Part-1	200

	Mechanical Test Parameter	Test Method (s)	Testing Charges (excludes taxes) in Rs.
17.	Twist in yarn	ASTM D 1422 ISO 7211-4 ASTM D 1423 IS 832	200
18.	Linear density of textile fibres	ASTM D 1577	250
19.	Tensile strength of fibre	ASTM D 3822 ISO 5079	500
20.	Water permeability	ASTM D 4491 ISO 11058	500
21.	Taber abrasion	ASTM D 3884	750
22.	Trapezoid tear strength	ASTM D 4533	500
23.	Breaking strength by wide width method	ASTM D 4595 ISO 10319	1000
24.	Thermal resistance	ASTM D 1518	400
25.	Grab strength	ASTM D 4632	400
26.	Apparent opening size	ASTM D 4751	500
27.	Seam strength	ASTM D 1683 ISO 13935-2	500
28.	Seam slippage	ASTM 1683 ISO 13936-1	500
29.	Grab strength for Nonwovens	ISO 9073-18	400
30.	Air permeability for Nonwovens	ISO 9073-15	350

Mechanical scope under NABL accreditation:

S. No.	Product(s) / Material of test	Specific tests performed	Test Method / Standard against which tests are performed	Range of testing Limits of detection	Uncertainty of Measurement (±)
1	Fibers	Staple Length for man made fibres	IS 10014 -1984 Part 1	10 mm to 300 mm.	0.16 mm at 39.8 mm.
2	Fibre	Linear density of single fibres	ASTM D 1577 - 07	0.27 D to 153 D	0.8 D at 1.672 D
3	Fibre	Tensile strength of single fibre	ASTM D 3822 - 07 ISO 5079 - 96	1 gms to 500 gms	± .01 gms at 7.86 gms
4	Yarn	Linear density of yarns	IS 1315-1977 IS 7703 - 1990 PART 1 ASTM D 1907 -07 ISO 2060 - 95	10D to 1000D	1.2 D at 201.7 D
5	Yarn	Crimp and Count of yarn removed from fabrics	IS 3442-1980 ASTM D 1059 -01 ISO 7211 – 84 - 5	0.1 Ne to 150 Ne 10 D to 3000 D Crimp % : 0.1% to 150%	± 1.5 Ne at 12.84 Ne
6	Yarn	Twist in yarn	IS 832-1985 ASTM D 1422 -99 ISO 7211 – 84 - 4 ASTM D 1423 -02	1 to 999 turns per inch	94 TPM at 781.6 TPM
7	Yarn	Single yarn- Breaking load and %elongation at break	IS 1670-1991 ASTM D 2256 - 08	1 N to 1 kN 1% to 800%	10 gms at 542.8 gms.

S. No.	Product(s) / Material of test	Specific tests performed	Test Method / Standard against which tests are performed	Range of testing Limits of detection	Uncertainty of Measurement (±)
8	Yarns	Lea strength of yarns spun on cotton system (CSP)	IS 1671-1977	0.01 kN to 2 kN	319.2 CSP at 2427.4 CSP
9	Yarn	Unevenness of polyester and polyamide flat yarn	IS 7703-1987 PART 5	U % & CV % Upto 30 %	± 10 %
10	Fabrics	Breaking load and % % elongation of woven textile fabrics	IS 1969-1985 ASTM D 5035 - 06 ISO 13934-99 -1	0.1 kN to 50 KN 1% to 200%	Warp:2.14 kg at 88.5 kg. Weft: 2kg at 52.3 kg.
11	Fabric	Air Permeability	ASTM D 737 - 04 ISO 9237 - 95	10 Pa to 2500 Pa	± 10 %
	Non wovens	Air permeability	ISO 9073 – 15 -07	10 Pa to 2500 Pa	± 10 %
12	Fabric / Technical Textile	Abrasion Resistance (Martindale)	ASTM D 4966 - 07 ISO 12947 – 98 – 1	Upto 9999 Cycles & Above	100 cycles at 40,000 cycles
13	Fabric / Technical Textile	Taber Abrasion Resistance	ASTM D 3884 - 07	Upto 9999 cycles & Above	± 0.5 for ratin in change in shade
14	Fabric	Puncture Resistance Index CBR	ASTM D 4833-88 ASTM D 6241 ISO 12236 - 06	1 N to 10 kN .1 kN to 100 kN	5 N at 563 N
15	Fabric / Technical Textile	Apparent Opening Size	ASTM D 4751 - 95	75 µ to -850 µ	± 10 % at 200 microns
16	Fabric / Technical Textile	Thermal resistance	ASTM D 1518 - 03	1Tog to 12 Tog	0.0348 W/n.K at .031 W/n.K
17	Fabrics	Pilling resistance of fabrics	IS 10971-1984	1 -5 rating	1 /2 Grade rating
18	Fabrics	Length and width of woven fabrics	IS 1954-1990 ASTM D 3774 -04 ISO 22198 ASTM D 1907 ISO 2060 - 95	Complete range.	17 cms at 92.92 cms. for length 0.31 cms. at 112.1 cm for width
19	Fabric	Thickness of woven and knitted fabrics	IS 7702-1975, ASTM D 1777 - 07	0.01 – 10 mm. 0.001 mm to 4 mm.	28 µ at 193.2 µ
20	Fabric	Mass per unit length nd mass per unit area in woven fabrics	IS 1964-2001, ASTM D 3776 -07 ISO 7211 – 84 - 6	Complete range	1.96 gms/ sq.metre at 206.96 gms/ sq.metre
21	Fabric	Threads per unit length in woven fabrics	IS 1963-1981 ASTM D 3775 - 08 ISO 7211 – 84 – 2	1 to 2500/dm	0.8 EPI at 94.6EPI 0..5 PPI at 76.4 PPI
22	Fabric	Recovery from creasing of textile fabrics by measuring the angle of recovery	IS 4681-1981	20-160°	2° at 279.4°
23	Fabric	Stiffness (Bending Length)	ASTM D 1388 – 07 Option A	0.1 cm to 8 cm	0.4 mm. at 2.602 mm.
24	Fabric / Technical Textile	Breaking strength by Wide width method %Elongation	ASTM D 4595 - 94 ISO 10319 - 96	1 N to 150 kN 1% to 200%	Warp: 0.5 kN at 38.36 kN Weft: 0.2 kN at 37.1 kN

S. No.	Product(s) / Material of test	Specific tests performed	Test Method / Standard against which tests are performed	Range of testing Limits of detection	Uncertainty of Measurement (±)
25	Fabric	Grab Strength %Elongation	ASTM D 5034 ISO 13934 - 99 – 2	1 N to 100 kN 0.1% to 200%	13 lbs at 293.6 lbs for warp 7 lbs at 233.98 lbs for weft
	Fabric / Technical Textile	Tensile strength (Grab Method) %Elongation	ASTM D 4632 – 91 ISO 13934-1999 Part-2	1 N to 100 kN 0.1% to 200%	Wp : 57.8 N at 753.6 N Wt : 31.1 n at 1092N
	Non wovens	Tensile strength (Grab Method) %Elongation	ISO 9073 – 18	1 N to 100 kN 0.1% to 200%	
26	Fabric	Tear strength (woven) (Nonwoven)	ASTM D 2261–07(a) ISO 13937 -2000– 2 ASTM D 5733 - 95	5 kN	3.27 lbs at 106.18 lbs for warp 4.68 lbs at 95.68 lbs for weft
27	Fabric /Technical Textile	Trapezoid tear strength	ASTM D 4533 - 91	5 kN	Warp: 14.8 N at 472.4 N Weft: 20.8 N at 440 N
28	Fabric	Failure in sewn seams of woven fabrics	ASTM D 1683:2007	1000 N	3.5 N at 349.5 N for warp 2.0 N at 237.9 N for weft
	Fabric	Seam slippage and Seam strength	ISO 13936-1:2004 ISO 13935-2:1999	1000 N	± 10 %
29	Fabrics	Bursting strength and bursting distension of fabrics: diaphragm method	IS 1966-1975, ASTM D 3786 - 08 ISO 13938 - 99 – 2	1kPa to 7000 Kpa .01kg/cm^2 to 70 kg/cm^2	0.279 kgs/sq.cm at 35.06 kgs/sq.cm.

Scope of Chemical Tests

	Mechanical Test Parameter	Test Method (s)	Testing Charges (excludes taxes) in Rs.
1.	Moisture content	ASTM D 2654	200
2.	Fiber analysis : qualitative	AATCC-20 IS 667	200
3.	Fiber analysis : quantitative	AATCC-20 A ISO 1833 IS 2006 IS 1819 IS 2005 IS 3416	500
4.	Flammability	ASTM D 1230 ISO 6941:2003	300
5.	Whiteness of textiles	AATCC 110 AATCC 173	500
6.	Color fastness to artificial light	AATCC 16 Option 3 ISO 105 B02 IS 2454	700
7.	Color fastness to water	AATCC 107 ISO 105 E01 IS 767	200
8.	Color fastness to sea water	AATCC 106 ISO 105 E02 IS 690	250

	Mechanical Test Parameter	Test Method (s)	Testing Charges (excludes taxes) in Rs.
9.	Color fastness to perspiration	AATCC 15 ISO 105 E04	300
10.	Color fastness to crocking / rubbing	IS 971 AATCC 8 ISO 105 X12 (E)	150
11.	Determination of pH value of aqueous extract of textile materials	IS 766 AATCC 81 ISO 3071	200
		IS 1390	
12.	Determination of skew change of fabric and garment	AATCC 179	400
13.	Color fastness to laundering	AATCC 61 ISO 6330 IS 687 IS 3361 IS 764 IS 765 IS 3417	400
14.	Color fastness to heat (hot pressing)	AATCC 133 IS 4636	200
15.	CMC calculation of small color difference for acceptability	AATCC 173	500
16.	Hydrostatic pressure test	AATCC 127 Option 2	300
17	Water repellency : spray test	AATCC 22 IS 390	250
18	Antifungal activity of textiles	AATCC 30, Part 3	1200
19	Antibacterial finishes on textile materials	AATCC 100	1400
20	Antibacterial activity assessment-parallel streak method	AATCC 147	700
21	Accelerated UV exposure	ASTM D 4355 ASTM G 154 AATCC 169	20000 (500 hrs)
22	Color fastness to washing with soap or soap and soda	ISO 105 C 01, 02, 03, C 04, C05	250 each 300 400
23.	Shower test Bundesmann	ISO 9865	300
24	Spirallity for knitted garment	ISO 16322, Part 1 and Part 2	500
25	Color Fastness to dry cleaning	ISO 105 DO1	300
26	Absorbency of Textiles	AATCC 79	200

Chemical Scope under NABL accreditation:

S. No.	Product(s) / Material of test	Specific test performed	Test Method / Standard against which tests are performed	Range of testing/ limits of Operation / Limits of Detection	MU (±)
1	Fibre/ Yarn /Fabric	Identification of textile fibers.	IS: 667 -1981 Reaff. 2003 AATCC – 20 : 2007	Qualitative	NA
2	Fibre/ Yarn /Fabric	Percentage composition of binary mixture of protein fibre with certain other non-protein fibres (Method based on clean dry mass)	IS: 2006-1988 Reaff. 2004 (SASMIRA IHM-01 & IHM-03) AATCC – 20 A : 2008 ISO 1833 Parts 4:2006	3 – 100	± 1 % at 67 % polyester & 33 % wool

S. No.	Product(s) / Material of test	Specific test performed	Test Method / Standard against which tests are performed	Range of testing/ limits of Operation / Limits of Detection	MU (±)
3	Fibre/ Yarn /Fabric	Percentage composition of binary mixture of regenerated cellulose and cotton (Method based on clean dry mass)	IS: 1889-1979, Part IV, Sulphuric acid method Reaff. 2005 (SASMIRA IHM-01 AATCC – 20 A :2008	3 – 100	± 1% at 69% polyester & 31% regenerated cellulose
4	Fibre/ Yarn /Fabric	Percentage composition of binary mixture of nylon 6 or nylon 6,6 with other fibres (Method based on clean dry mass)	IS: 2005-1988 Reaff. 2008 (SASMIRA IHM-01 & IHM-03) AATCC – 20 A :2008 ISO 1833Parts 7: 2006	3 – 100	± 3
5	Fibre/ Yarn /Fabric	Percentage composition of binary mixture of polyester fibre with cotton and regenerated cellulose (Method based on clean dry mass)	IS: 3416-Part 1, 2008 (SASMIRA IHM-01 & IHM-03) AATCC – 20 A :2008 ISO 1833 Parts 11: 2006	3 – 100	± 1.0 % at 67 % polyester & 33% cotton
6	Fibre/ Yarn /Fabric	Determination of pH value of aqueous extract of textile materials	IS: 1390-1983 Reaff. 2004 AATCC 81:2006 ISO 3071:2005	1 to 14	± 0.5
7	Fibre/ Yarn /Fabric	Determination of colorfastness of textile materials to washing 1. Change in shade 2. Staining on adjacent fabric	AATCC 61:2007 -1A IS/ISO 105 C10 :2006	Rating 1 to 5 Rating 1 to 5	NA
8	Fibre/ Yarn /Fabric	Determination of colorfastness of textile materials to artificial light (xenon lamp) Rating on blue wool scale	IS: 2454-1985Reaff. 2006 AATCC -16: 2004 option 3 ISO : 105 BO2:2002	Rating 1 to 8 Class 1 to 8 Class 1 to 8	NA
9	Fibre/ Yarn /Fabric	Determination of colorfastness of textile materials to perspiration (Acidic & Alkaline) 1.Change in shade 2.Staining on adjacent fabric	IS: 971-1983 (Reaffirmed 2004) AATCC 15:2007 (acidic only) ISO 105-E04-200	8Rating 1 to 5 Rating 1 to 5	NA
10	Fibre/ Yarn /Fabric	Determination of colour fastness of textile materials to dry-heat (using Fix-o-test instrument) (Staining on adjacent fabric)	IS: 4636 - 1988 Reaff. 2004	Rating 1 to 5	NA
11	Fabric	Determination of water repellency of fabrics by cone test	IS: 7941-1976 Reaff.2004	1 to 400 ml i) amount of water penetrated water collected in ml 1 to 400 ml ii) amount of wetting of the outer surface visual observation using AATCC 22-2005 standard photograph as guidelines	1 ml NA
12	Fabric	Determination of water repellency of fabrics by water spray test	IS: 390-1975 Reaffirmed 2003 AATCC 22:2005	Rating 0 to 100	NA

S. No.	Product(s) / Material of test	Specific test performed	Test Method / Standard against which tests are performed	Range of testing/ limits of Operation / Limits of Detection	MU (±)
13	Fabric	Determination of rubbing fastness of textile materials (Dry and Wet)	IS 766-1988 Reaff. 2004 AATCC 8:2007 ISO 105 X-12: 2001	Rating 1 to 5	NA
14	Fabric	Colorfastness to water	IS 767RA2004 AATCC 107 :2007 ISO 105 :E01:2010	Rating 1 to 5	NA
15	Fabric	Colorfastness to Sea water	IS 690 R.A2004 AATCC 106:2007 ISO 105 EO2;1996	Rating 1 to 5	NA
16	Fabric	Colorfastness to organic solvent	IS 688 - 1988 RA 2004 ISO 105 –X05 :1994	Rating 1 to 5	NA
17	Fibre/ Yarn /Fabric	Dimensional changes on soaking in water	IS 2977- 1989 R.A 2005	0 to 20 %	± 0.5 at 2.5 % shrinkage
18	Fabric	Moisture Content	ASTM D 2495:2007	Upto 20%	± 0.4 at 9 %
19	Fabric	Flammability	ASTM D 1230:1994 RA.2004	60 seconds	5 second
20	Fabric	Whiteness of Textiles	AATCC 110: 2005	Upto 200	± 3
21	Fabric	CMC Calculation of small color difference for acceptability	AATCC 173:2009	ΔE cmc $\leq$ 10	± 5
22	Yarn /Fabric	Identification of Class of Dyes on Textiles Material Cotton and other Cellulosic Fibers	IS 4472 –PART I :1967	Qualitative test	NA
23	Yarn /Fabric	Identification of Class of Dyes on Textiles Material Wool , Silk and other Protein Fibers	IS 4472 –PART 2 :1968	Qualitative test	NA
24	Yarn /Fabric	Identification of Class of Dyes on Textiles Material Man Made Fibers	IS 4472 –PART 3 :1973	Qualitative test	NA
25	Yarn /Fabric	Estimation of % Moisture on Finish , Ash and Fatty Matters on Grey and Finished Cotton Textiles Materials	IS 199:1989 R.A 2005	Up to 20 %	± 0.4 at 9 %
26	Yarn /Fabric	Color Fastness to Saliva	DIN – 53160-1:2010	Rating 1to 5	NA
27	Yarn /Fabric	Color Fastness to Rubbing with Organic Solvent	IS 3426:1986 RA 2004	Rating 1to 5	NA

Biological Scope under NABL accreditation:

S. No.	Product / material of Test	Specific test performed	Test Method / Standard against which tests are performed	Range of testing/ limits of Operation / Limits of Detection	MU (±)
1	Fibre	Antibacterial Activity Assessment of Textile Materials:Parallel Streak Method	AATCC 147- 2004	Present/ Absent	-
2	Fibre	Antifungal Activity, Assessment of textile material : (Part 3)	AATCC 30 - 2004	Rating from 0 to 4	-
3	Fibre	Antibacterial Finishes on Textile Materials: Assessment of	AATCC 100 - 2004	0 to 100 %	Under process

Incubation Center

In order to catalyze new product development and production and marketing activities of agrotextile products, the COE on Agrotech also has set up an incubation centre. The Agrotech COE is engaging with various stakeholders from the industry to generate suggestions on product development ideas and also areas of potential collaboration on product innovation. This will ensure proper utilisation of COE facility and support the working trials and various shop floor trials.

List of Demonstration Machineries:

Sr. No.	Equipment
1.	Non woven needle punching machine
2.	Warp Knitting Machine
3.	Weaving Machine
4.	Laboratory Drying, Condensation and Fixation Apparatus
5.	Twin screw Extruder
6.	High Speed mixer
7.	Hydraulic Lab press
8.	Tape yarn manufacturing- Film slitting
9.	Blown film manufacturing
10.	Monofilament spinning
11.	Beaming machine for warp knitting

Select images of the incubation centre equipment

Raschel Warp Knitting Machine, RS 4N, E12, 170"

DILO Needle punched nonwoven line, 700 mm

Dornier Rapier PTS 2/16, 190 cm

Agrotech Products

FISHING NETS

Composition:

- Nylon mono-filament, multi-filament or HDPE

Construction:

- Warp knitted

Advantages:

- Helps in fishing and in fish farming

SHADE NETS

Composition:

- Polyethylene tape yarns or mono-filaments

Construction:

- Warp knitted

Advantages:

- Low weight
- Acts like a sunscreen
- Protection against strong wind

MULCH MATS

Composition:

- Jute, polypropylene, polyethylene

Construction:

- Woven, non-woven

Advantages:

- Weed control around newly planted trees and shrubs
- Photo-degradable
- Cost effective

HARVEST NETS

Composition:

- Polyethylene mono-filaments

Construction:

- Warp knitted

Advantages:

- Perfect collecting fruits which fall off the tree when they are ripe.
- Simplifies and rationalizes the harvesting process

BIRD PROTECTION NET

Composition:

- Polyethylene tape yarns or mono-filament yarns

Construction:

- Warp knitted

Advantages:

- To protect the fruits eaten by birds
- Light weight
- Durable and strong

ANTI INSECT NETS

Composition:

- HDPE mono-filaments

Construction:

- Warp knitted advantages

Advantages:

- Insect net blocks the penetration of insects into the crop environment
- Reduces the use of pesticides, saving labor, time and money for the grower

CROP COVERS

Composition:

- Polypropylene

Construction:

- Woven, non-woven

Advantages:

- Low wind sensitivity
- No excess water retention on the fabric surface
- UV stabilized
- Extremely strong
- Long lasting

List of Companies Engaged in Manufacturing of Agrotech Products

	Name	Location	Products
1.	Gujarat Fisheries unit	Ahmedabad, Gujarat	Fishing Net and fishline cargo nets, twine, etc.
2.	Ruparel Plastics	Mahuva , Gujarat	Fishing nets, cargo nets, twine, etc.
3.	Makharia Netting	Dahod, Gujarat	Fishing net and fishline
4.	J.K. Industries	Rajkot, Gujarat	Fishing net and fishline
5.	Globe Cast	Umbergaon	Fishing net and fishline
6.	Chain Synthetics (P) Ltd.	Porbandar, Gujarat	Fishing net and fishline
7.	Jayshree Marine nets	Nani Daman	Fishing net and fishline
8.	Khetan Twist Net(P) Ltd.	Mumbai	Fishing net and fishline
9.	Fisheries (P) Ltd.	Bardoli, Gujarat	Fishing net and fishline
10.	Amar Polyfilms	Porbander, Gujarat	Fishing net and fishline
11.	Tuflex India (www.tuflex.net)	Vadodara, Gujarat	Agroshade Net
12.	Agrotech	Anand, Gujarat	Agroshade Net
13.	Technofabrics	Udhna, Gujarat	Agriculture Net
14.	Rishi Packer	Silvassa	Crop Protection Net
15.	ARD Polymer	Silvassa	Crop Protection Net
16.	Unimin	Silvassa	Shade Net/fabrics
17.	Fiberweb India Ltd	Silvassa	Woven and nonwoven crop covers
18.	Malmo Exim	Mumbai	Shading nets, mulch mats
19.	Kwality nets	Mumbai	Shading nets
20.	Netlon	Baruch	Shading nets
21.	Mysore Nandi Tarpaulins Mfg. Co.	Secunderabad, Andhra Pradesh	Agricultural shade nets
22.	Planet Plastics	Nagpur, Maharashtra	Shade net and anti bird net
23.	KT Exports (I) Pvt. Ltd	Mumbai, Maharashtra	Shade nets such as agriculture nets, windbreaker nets, bird nets, weed control - non woven, geolay and frost cover
24.	Ever Green Industries	Coimbatore, Tamil Nadu	Shade net
25.	Affy Export India Pvt. Ltd.	Ghaziabad, Uttar Pradesh	Nets, shade nets, agriculture net, scaffolding nettings, silt fence, woven fabric and ground Covers.

	Name	Location	Products
26.	CTM Technical Textiles Limited	Ahmedabad, Gujarat	Agro shading nets
27.	Sree Durga Industries	Coimbatore, Tamil Nadu	Shade nets
28.	Creative Plastics	Mumbai, Maharshtra	Shading net, insect net, bulb sleeves
29.	Bhindarwala Traders	Mumbai, Maharshtra	Anti-bird nets, safety nets, shading nets, throwing fishing nets, nylon fishing twine, nylon fishing line
30.	Neo Sack Limited	Pithampur, Madhya Pradesh	HDPE/ PP woven sacks, raschel bags, bags with tie-string, shade nets and other allied Products
31.	Phuar Agrotech	Delhi Cantonment, Delhi	Shade net, insect net and irrigation Components
32.	Ratna Fiber Industries	Bangalore, Karnataka	Insect proof nets, window mesh, "UV Stabilized" agro shade net, anti-virus nets
33.	India Plastic Associates	Vadodara, Gujarat	Garden fencing and shading net
34.	Premier Tarpaulins	Coimbatore Tamil Nadu	Tarpaulins, shade nets, pond liners, chilly drying mats
35.	Bokaria Meshes and wires	Chennai, Tamil Nadu	Plastic shade nets, light weight nylon shade nets, colored shade nets, window screen shade nets and nylon shade nets
36.	Br Agri Factors	Daman	Shade nets and monofilament nets
37.	Essen metals & alloys	Pune, Maharashtra	Shade Net, Shade Net Ropes, Insect Nets
38.	Reach netting Solutions Pvt. Ltd.	New Delhi	Shade nets, bird protection nets, Monofilament nets
39.	Shree Siddhivinayak Polyhouse	Pune, Maharashtra	Fabricator natural ventilated greenhouse, poly house, tunnel type shade nets.
40.	Super Paulin	Coimbatore, Tamil Nadu	Shade nets
41.	Gulati Canvas	Delhi	Shade nets, Canvas
42.	Lepakshi Tarpaulin Industries	Hyderabad, Andhra Pradesh	Agriculture Shade nets
43.	Bharat Tarpaulin Co.	Bangaluru, Karnataka	Shade nets, tarpaulins
44.	Flora Agrotech	Vapi Gujarat	Shade nets, monofilament nets
45.	Indonet Plastic Industries	Vadodara, Gujarat	Shade nets,
46.	Neelgiri Tarpaulin Co.	Salem, Tamil Nadu	Shade nets, tarpaulins, Poultry shed
47.	R. R. Polynets	Valsad, Gujarat	Shade nets, insect nets, bird protection net, pond liners
48.	Agro-tech	Anand, Gujarat	Shade nets, vermicompost bed, poultry Shed nets
49.	Betala Canvas Co.	Chennai, Tamil Nadu	Shade nets, Tarpaulins
50.	Rajdeep Agri Products ltd.	Delhi	Shade nets
51.	Hind Fab	Ahmedabad, Gujarat	Shade nets, Packing sacks, Tarpaulins
52.	Creative Polymers	Halol, Gujarat	Shade nets, Horti pots
53.	Rajvi Plastotech Pvt. Ltd.	Vapi, Gujarat	Shade nets
54.	Fortune Agro nets	Vapi, Gujarat	Shade nets, poly sacks
55.	Hari Om Polysacks	Vapi, Gujarat	Shade nets, polysacks
56.	Venkatesh Agro shde nets	Vapi, Gujarat	Shade nets
57.	J. B. Packaging	Ahmedabad, Gujarat	Shade nets, insect nets
58.	Balaji Polynets	Vapi, Gujarat	Shade nets

Information Center

The COE has also established an Information Centre to facilitate dissemination of information through sample exhibits, awareness programmes, e-library, video conferencing and publication of books and papers and technical know-how literature to the manufacturers and users of agrotextile products. List of books, journals and standards procured under the Centre of Excellence on Agrotech is indicated below.

Books

Sr. No.	Title of Books/Journals	Publisher	Author	Year of Publishing
1.	Properties & Performance of Natural Fibre	Woodhead Publishing,	K. Pickering	2008
2.	Fabric Testing	Woodhead Publishing,	J Hu	2008
3.	3-D Fibrous Assemblies	Woodhead Publishing,	J Hu	2008
4.	Structure & Mechanics of Textile Fibre Assembly	Woodhead Publishing,	P Schwartz	2011
5.	Indian Man Made Fibre Industry	CARE research		2010
6.	Coloration Technology (2009)	SDC		2009
7.	Monthly Periodical on Textile Featuring research in TT (2009)			2009
8.	Textile Research Journal (2009)	SAGE		2009
9.	ACTA Horticulture	ISHS		2011
10.	Floriculture	Media Today Pvt. Ltd.		2012
11.	Textile Month	World Textile Information Network		2011

List of Standards

- BS EN 471:2003 + AI 2007
- BS EN ISO 6941:2003
- BS 3356:1990 Incorporating Amendment No. 1
- BS 3321:1986
- BS : 2782-10 Method 1006:1978
- BS:3090:1978 Incorporating Amendment No.1
- BS 3181-1:1987
- BS 3183: 1968
- BS 3271:1970 Incorporating amendment No. 1
- BS 4569: 1983
- BS: 1771-2 : 1990
- BS 3424-21:1993
- BS EN 29073-3 :1992, ISO 9073-3:1989, Incorporating Amendment No. 1
- BS EN ISO 105-AD6: 1997
- BS EN ISO 105- B04:1997
- BS EN 29865:1993, ISO:9865:1991
- BS EN ISO:10319:1996, ISO 10319:1993
- BS EN ISO 105-C08:2002 + AI:2008
- BS EN ISO 105-C10 2007
- BS EN ISO 105-C07:2001
- BS EN ISO 6330:2001
- BS EN 20811:1992, ISO 811: 1981 Incorporating Amendment No.1
- BS EN 22313:1992, ISO 2313:1972
- BS EN 24920:1992, ISO 4920:1981
- BS EN ISO 9864:2005
- BS ISO 7211:3, 1984
- BS ISO 7211-4, 1964
- BS ISO 7211-5:1984
- BS EN ISO 3175-3:2003
- BS EN ISO 9237:1995
- BS EN 199586:2008
- BS ISO 4880:1997
- BS EN ISO 6940:2004
- BS EN ISO 5470-2: 2003 Incorporating corrigendum No.1
- BS EN ISO 5470-2; 1999
- BS 3424-36; 1993
- BS 1932-2:1989 Incorporating amendment No.1
- BS 2471:2005
- BS 4554: 1970
- BS 1903: 1981
- BS 1781: 1981
- BS 5066: March 1974 UDC 677: 017 633 2
- BS EN 12447: 2001
- BS EN 13392: 2005
- BS EN 1103: 2005
- BS EN 1102: 1996
- BS EN 13562: 2000
- BS EN 13738: 2004 Incorporating corrigendum No.1
- BS EN 20105 - No.1: 1995, ISO 105-No.1 1993
- BS EN ISO 12127: 1998
- BS EN ISO 105- B01: 1999
- BS EN ISO 105 - B02: 1999 Incorporating corrigendum Nos. 1 & 2 & Amendment 1
- BS EN ISO 105- B03: 1997
- BS 7342: 1990, ISO 8498:1989
- BS 5742: 1989
- BS 8475: 2006
- BS 7343: 1990, ISO 8499: 1990
- BS EN 530: 1995 Incorporating Amendment no. 1
- BS EN 1624: 1999
- BS 7552-1: 1992, ISO 9866-1: 1991
- BS 3424- 13: 1999
- BS 3408: 1992 Incorporating Amendment No.1

List of Standards

- BS EN ISO 105-B06:2004, Incorporating Amendment No.1 to BS ISO 105 BO6:1998
- BS EN ISO 16663-1:2003 Incorporating Corrigendum No.1
- BS EN ISO 16663-1:2003 Incorporating Corrigendum No.1
- BS EN ISO 11058:1999
- BS EN ISO 105-C09:2003 Incorporating amendments No.1
- BS 5438:1989 Incorporating amendment No.1 and 2
- BS EN ISO 105-B08:1999
- BS EN ISO 105-B05:1996
- BS EN 29073-1:1992, ISO 9073-1:1989 Incorporating Amendment No.1
- BS EN 1897:2001 Incorporating corrigendum No.1
- BS EN 12224-2000
- BS EN ISO 105-E06:2006
- BS EN 13895:2003
- BS EN ISO 105-AO4:1999
- BS EN ISO 105:405:1997
- BS 5523:1997, ISO 3572 1976
- BS EN 13772:2003
- BS EN 13844:2002
- BS EN 20105-AD2:1995, ISO 105-A02:1993
- BS EN ISO 5084:1997
- BS 3424: Part 14: 1985
- BS EN 12225: 2000
- BS EN ISO 105-C06: 1997 Incorporating Technical corrigendum No.1
- BS 4029: 1978
- BS EN ISO 105-AO1: 1996 Incorporating Amendment - No.1
- BS EN ISO 3175: 1998
- BS 4674: 1971 Incorporating Amendment No.1
- BS EN ISO 105-E-11: 1997
- BS EN ISO 105- E10: 1997
- BS EN 1049-2: 1994
- BS 3424 20: 1987
- BS 3424-19: 1989
- BS 3424- 18: 1986
- BS 3424- 17: 1987
- BS EN ISO 3175- 2: 1998
- BS 3424- 34: 1992
- BS 3424: 31 1990
- BS 3424: 25: 1993
- BS 3424- 24: 1990
- BS EN ISO 1973: 1996
- BS 7837: 1996
- BS EN ISO 2060: 1995
- BS EN ISO 105- E09, 1997 Incorporating Technical corrigendum No. 1
- BS EN ISO 105- E08; 1997
- BS EN ISO 105- E07: 1997, Incorporating Technical corrigendum No.1
- BS EN ISO 105- C12: 2006
- BS EN ISO 105- E01: 1996 Incorporating Technical corrigendum No.1
- BS 3424- 16: 1995
- BS 3404: 1992 Incorporating Amendment No.1
- BS 3424- 0:2000
- BS 3424-12: 1996, ISO 1419: 1995 Incorporating Amendment Nos 1 & 2
- BS 3424- 8: 1983 Incorporating Amendment No. 2
- BS 2782- 7: Method Y21 A: 1988
- BS 8459: 2005 Incorporating corrigendum No.1
- BS EN 1773: 1997
- BS 3424- 5: 1982
- BS 3424- 38: 1998
- BS EN ISO 3071: 2006
- BS EN 20105- A03: 1995, ISO 105-A03: 1993
- BS 1771-1: 1989
- BS 2043: 1968
- BS 2610: 1978 Incorporating Amendment No.1
- BS EN ISO 2061:1996
- BS EN ISO 105-ED5:2006
- BS EN ISO 105-E04:2009
- BS EN ISO 105-E03:1997
- BS EN ISO 105-E02:1996 Incorporating technical corrigendum No.1
- BS-3424-26:1990
- BS EN ISO 105-X11:1996
- BS EN ISO 105-D01:1995, IS0 105-D01:1993
- BS EN ISO 105:D02:1996
- BS EN ISO 1101: 1996 Incorporating Amendment No.1

Technical Manpower

SASMIRA, Mumbai		
1	Mr. U. K. Gangopadhyay	Textiles & Technical Textiles
2	Dr M R Mathur	Textile Polymers & Chemistry
3	Dr. K. Tandon	Marketing & Project implementation
4	Mr. A. Oak	Marketing & Project implementation
5	Mr. H. Soni	Marketing & Project implementation
6	Mrs. A. S. Sudam	Textile testing and technical textiles
7	Mr. S. Saini	Development of Textiles
8	Mrs Manisha Hira	R & D in Technical Textiles
9	Dr R Ramakrishnan	Polymer Chemistry
10	Mr. R. P. Singh	Fibre Science and Technical Textiles
11	Ms. S. N. Shinde	Biotechnology
12	Mr. P. R. Survase	Textiles & Technical Textiles
13	Mr. P. R. Salunke	Biotechnology
14	Mr. M. Tiwari	Fibre Science and Technical Textiles
15	Ms P. Prajapathi	Fibre Science and Technical Textiles
16.	Mr. M.D.Walinjkar	Textile testing and technical textiles
17	Mr. H.D.Shah	Textile Chemistry
18	Mr. A.S. Mann	Textile Fibre Science & chemistry
19	Ms Purnima Chauhan	Textile Chemistry
20	Shri J S Sawant	Textile Chemistry & training
21	Shri A C Bhuta	Testing and evaluation
22	Shri V D Naik	Testing and evaluation
23	Ms A A Desai	Testing and evaluation
24	Shri A S Patil	Testing and evaluation
25	Shri H S Pandit	Testing and evaluation
26	Shri A R Talekar	Testing and evaluation
27	Shri N T Mistry	Testing and evaluation
28	Shri P G Kochrekar	Testing and evaluation
29	Shri D M Jani	Testing and evaluation
30	Ms A T Jhaveri	Testing and evaluation
31	Ms K A Hallur	Testing and evaluation
32	Ms L V Mhatre	Testing and evaluation
33	Shri R.K.Kulkarni	Testing and evaluation
MANTRA, Surat		
1	Dr. S. K. Basu	Textiles & Technical Textiles
2	Dr. Hima D. Joshi	Textile Chemistry
3	M. G. Patel	Textile Chemistry
4	B. S. Pancholi	Textiles
5	M. G. Parikh	Textile testing
6	A. M. Choksi	Textile Chemistry
7	A. D. Chauhan	Textile Testing
8	D. M. Prajapati	Textile Testing
9	S. R. Upadhyay	Textile Testing
10	D. V. Kantharia	Textile Testing
11	J. K. Patel	Textile Testing
12	K. N. Jadhav	Textile Testing
NAU, Navsari		
1	Dr. A. R. Pathak	Application of Agrotextile products and field application
2	Dr. R. G. Patil	
3	Er. E. M. Solia	
4	Dr. S.G. Patil	

List of Standards Formulated

1. Glossary of Agrotextiles finalized and accepted by BIS. Under publication
2. Specification for 50% shade nets for horticulture applications - finalized and accepted by BIS. Under publication
3. Specification for woven ground covers-finalized; being sent to BIS for acceptance
4. Specification for 75% shade nets for horticulture applications-finalized; being sent to BIS for acceptance
5. Specification for 90% shade nets for horticulture applications-finalized; being sent to BIS for acceptance

List of Manuals Prepared

1. A concept paper of Agrotextile with special focus on Protective Agrotextiles
2. A concept paper on Agrotextiles in Hindi and Marathi languages for local publicity
3. A 25 minute film on Agrotech COE 'Samruddhi ki disha mein' has been prepared in English as well as popular regional languages Hindi, Marathi and Tamil highlighting
    i. COE activities and facilities created
    ii. Potential products and application areas of Agrotextile
    iii. Success stories of few manufacturers and users
4. A short 5 min. film highlighting the usage and benefits of key Agrotextile products has also been prepared
5. A ready reckoner for shade nets.

R&D Projects on Agrotech Undertaken/Under Progress

SASMIRA

1. Development of reflective agrotextiles for Sun Management
2. Development of specialty fabric for water conservation and soil erosion control used in horticulture application
3. Development of durable, breathable and barrier work wear fabrics for agrotextile applications
4. Development of PET/ nanoclay nanocomposite for barrier packaging
5. Evaluating compatibility & establishing methodology for simultaneous functional finishes for textile
6. Standardisation of norms for agricultural shade net
7. Dyeing of polypropylene using nanotechnology
8. Development of Super absorbent polymer mats for horticulture applications
9. Establishing correlation on UV Stability of Technical Textiles under different exposure conditions
10. Development of Electrically Conductive PET/CNT Nanocomposite Film
11. Development of UV fluorescent yarn for use in agrotextile to detect counterfeits
12. Design and development of an instrument set-up for measuring the photo energy transmitting capability of horticultural shading nets.

MANTRA

1. Development of multilayer fabrics for sportswear (in progress)
2. Smart fabrics/garment products with smart colours for security labeling
3. Development of innovative fabrics from PTT yarn and to set processing parameters for them

Training Programmes Offered

The centre assists the manufacturers in development of standard agrotextile products and users in adopting the agrotextile products in the most scientific way. This is facilitated through specific training workshops, online training and field demonstrations. In addition, customised courses are developed to address the specific needs of the industry. The following section depicts the various training modules being conducted by the COE on Agrotech.

I. Short Term Courses in Technical Textiles

Short Term Course	Content
1. Orientation course in Agrotextiles Duration : 1 week Batch size : 20 Course fee : Rs 500	I. Introduction to Agrotextiles ii. Classification of Agrotextiles iii. Composition and construction of Agrotextiles iv. Manufacturing of Agrotextiles v. Testing and evaluation of Agrotextiles vi. Market scenario of Agrotextiles
2. Testing and evaluation of technical textiles Duration : 1 week Batch size : 20 Course fee : Rs 1,000 Qualification : Graduation in Science/ Diploma or Degree in Textiles	i. Introduction & classification of Technical Textiles ii. Functional Requirements of Technical Textiles iii. Principles of Testing and Evaluation iv. Introduction to various test standards v. Standard Test methods for evaluating Technical Textiles vi. Testing and evaluation of Technical Textiles
3. Crash course in Testing and evaluation of technical textiles (Customised) (Theory & Practical Demonstration) Duration : 3 days Batch size : 5 max. Course fee : Rs 5,000 Qualification : Graduation in Science/ Diploma or Degree in Textiles	i. What, Why and How of Technical Textile Testing (Specific areas) ii. Introduction to various test standards iii. Standard Test methods for evaluating Technical Textiles(Specific areas) iv. Testing and evaluation of Technical Textiles (Specific areas) v. Practical Demonstration of Test Procedures (Specific areas)
4. Entrepreneurship in Agrotextiles Duration : 1 week Batch size : 20 Course fee : Rs 5,000	i. Introduction to Agrotextiles ii. Classification of Agrotextiles iii. Composition and construction of Agrotextiles iv. Manufacturing of Agrotextiles v. Testing and evaluation of Agrotextiles vi. Market research in Agrotextiles vii. Product development strategy viii. Product Pricing ix. Government Schemes and Fiscal Policies x. Business Promotion for Agrotextiles

II. Certificate Courses

Certificate Course	Topics Covered
Certificate course in Technical Textiles Duration : 6 months Batch : 25 Course Fees : Rs 25,000 Qualification : Graduation in Science/Diploma or Degree in Textiles	i. Introduction to Technical Textiles ii. Raw Material fibre / yarn etc. iii. Manufacturing of fibre / yarn iv. Polymer spinning v. Conventional & special spinning processes vi. Weaving vii. Non wovens viii. Knitting / braiding, with special focus on nets ix. Special finishes for Technical Textiles Various segments of technical textiles, specialisation in Agrotextile/ composites/ coated textiles x. Testing & Evaluation xi. International Bodies for testing and Certification xii. Practicals in Testing and Evaluation xiii. Entrepreneurship in Technical Textiles xiv. Elements of marketing xv. Marketing Strategies xvi. Manufacturers in India xvii. Exim Policies

II. Certificate Courses

Certificate Course	Topics Covered
Certificate course in Agrotextiles Duration: 3 months Batch : 25 Course Fees : Rs 25,000 Qualification : Graduation in Science/ Diploma or Degree in Textiles	i. Introduction to Agrotextiles ii. Raw Material fibre / yarn for Agrotextiles iii. Manufacturing Process for Agrotextile products iv. Finishing and Making up of Agrotextiles v. Testing & Evaluation of Agrotextiles vi. International Bodies for testing and Certification vii. Practicals in Testing and Evaluation viii. Entrepreneurship in Agrotextiles ix. Elements of marketing x. Marketing Strategies xi. Exim Policies

Awareness Programmes Conducted

Agriculture is the backbone of Indian economy. However due to industrialization and urbanization the availability of cultivable land is reducing. In order to feed the growing population, it is essential to get the best yield from the available cultivable land. Protective Agrotextiles enable protected cultivation and thus help improve the yield. The Centre of Excellence has an important mission of popularizing Agrotextiles. With this aim, several awareness programmes have been conducted till date and the same are listed below:

Agrotextile Seminars (SASMIRA)

1. 1st October 2008 Mumbai (Introductory, 200 participants)
2. 6th February 2009 Nagpur (200 participants)
3. 25th August 2009 Navsari (250 participants)
4. 5th March 2010 Targhadia, Rajkot (200 participants)
5. 22nd March 2010 Vijayawada (180 participants)
6. 28th October, 2010 Jalandhar (250 participants)
7. 16th December, 2010 Pune (200 participants)
8. 20th January 2011 One Day seminar on Protective Agrotextiles: Advantages and Future Prospects, Ichalkaranji, Kolhapur (250 participants)
9. 7th June 2011 - One Day seminar on Protective Agrotextiles: Advantages and Future Prospects, Coimbatore (200 participants)
10. 13th September 2011, Nashik, Workshop for farmers (2000 participants)
11. 19th September 2011, Dharwad, One day seminar on Protective agrotextiles – Advantages and Future prospects", (150 participants)
12. 16th December 2011, Seminar at Kisan 2011, Pune, (200 participants)
13. 22nd March 2012, Kolkatta, One day seminar on Protective agrotextiles– Advantages and Future prospects", (150 participants)

Agrotextile Seminars (MANTRA)

1. 8th October, 2009 International Seminar on coating and laminating including Agrotextile applications, Surat
2. 14th Dec., 2009 Half day Seminar on New Polyester Fibre, Surat
3. 8th January, 2010 Industry Innovations for sustainability and growth, Ahmedabad
4. 20th February, 2010 A destiny for investment in technical textiles in India with respect to Agrotextiles, Meditech and Coating and Laminated Textiles
5. 25th March, 2010 One day Conference on Technical Textiles, Indore
6. 30- 31st July, 2010 Two day Conference on Texellence '10, Ahmedabad
7. 23rd Dec., 2010 - International Seminar on Technical Textile: An emerging opportunity for growth, Surat

SASMIRA participated in agro-show KISAN 2010 organized by Kisan Forum Pvt. Ltd. at Pune during December 15 -19, 2010. To create awareness among the masses about the Agrotextile products and its uses, variety of Agrotextile products like shade-net, mulch mat, anti-hail nets etc. were displayed to the visitors. Almost 40,000 people visited SASMIRA's stall (approximately 8000 people per day) during the five day program. During the program, the team interacted with many farmers, consultants and industry people about various Agrotextile products, their uses, development techniques and quality testing.

Exhibition participation:

1. 25th to 27th August 2011, Technotex 2011 at Bombay Exhibition Center, Goregaon.
2. 22nd to 29th September 2011, International Exhibition of Textile Machinery (ITMA) 2011 at Fira de Barcelona Gran Via, Barcelona, Spain.
3. 10th to 12th October 2011, Techtextil India 2011, at Bombay Exhibition Centre, Goregaon.
4. 14th to 18th December 2011, 'Kisan 2011' at International Exhibition Center, Pune-Nashik Highway, Moshi.
5. 20th to 22nd January 2012, Western States Regional Agriculture Fair fromat Vyara Dist. Tap

Foreign Collaboration details

SASMIRA

1. American Association for Laboratory Accreditation, A2LA, USA for accredited testing services
2. Industrial Fabrics Association International, IFAI, USA for marketing and entrepreneurship in technical textiles. Also participation in seminars and exhibitions across the world
3. International Jute Study Group, IJSG, for development of Agrotextile product from natural fibres
4. Colorado State University for research and development in Technical Textiles.

MANTRA has collaborated with the De Monfort University, UK for R&D and technical information exchange.

Agrotech Prototypes to be developed

Today, a large share of market is dominated by fishing nets under the domain of Agrotextiles. The product is standardized and defined under Indian specifications. However, no norms and standards are available for the other large gamut of protective agrotextile products specifically shade nets, crop covers, ground covers, harvesting nets, insect nets and hail protection nets. Since the users are currently unaware about the substantial advantages of these products, the main activity of COE on Agrotextiles is creating awareness about the different products of Agrotextiles and their benefits. Also, the Centre of Excellence plays a significant role in testing, evaluation and establishment of standards for these products. Though there are few entrepreneurs in the field of agrotextiles in India, the entire gamut of products under agrotextiles are currently not being manufactured in India. Another important factor is that most of the entrepreneurs are small time players; no single manufacturer has the infrastructure facility and know-how to produce all the products. Hence, the Centre of Excellence can play a significant role in assisting the manufacturers of agrotextile products in development of new products suitable for usage by the Indian cultivators. The COE is well positioned to showcase new technology and process for development of the various agrotextile products to the manufacturers and entrepreneurs. The technology and processes can be suitably adopted in the industry after studying the market acceptability of the developed product prototypes.

A few of the envisaged prototype developments are:

1. Artificial soil from polymer fibre balls can be used as substitute for soil for plantation
2. Ground cover fabrics with screening for sunlight management
3. Knitted hoses for storing and transporting water near to plant roots for irrigation
4. Super Absorbent Polymer mats for water management during cultivation
5. Water retention nets using super absorbent polymer resin coating on the textile structure
6. Reflective ground cover
7. Barrier packaging for agrochemicals

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4. COE on Geotech

Lead: Bombay Textile Research Association (BTRA)

Background and Information of Parent Organization(s)

The Centre of Excellence on Geotech was launched in 2008 with Bombay Textile Research Association (BTRA) as the lead partner duly supported by Ahmedabad Textile Industry's Research Association (ATIRA).

BTRA

The Bombay Textile Research Association (BTRA) was set up in the year 1954 as an autonomous Co-operative Research Association. BTRA was the third in the series of Co-operative Textile Research Institutes set up in the aftermath of Indian Independence with a view to carry out research and other scientific work for textile and allied industries. The aim of the organisation is to provide day-to-day technological inputs to the industry and support the s & technological objectives set at the national level.

Geotech COE at BTRA is focused on the following areas:

- Testing of geo-textiles
- Testing of industrial filters
- Testing of coated textiles
- Testing of hygienic products (Medical Textiles)
- Evaluation of high loft wadding
- Product development through spun lace system (especially for products made from cellulosic fibre)

In the past two decades, many applications of geosynthetics have proved their value in civil engineering projects. This new class of material has added entirely a new dimension to the world of geotechnical engineering. Geosynthetic materials like Geotextiles, Geogrids, Geonets, Geocell and Geomembranes are used in various civil engineering activities.

The Centre of Excellence for Geotech at BTRA has been established to undertake the following:

- To create awareness for the use of geosynthetic products and to facilitate the evaluation and development of geosynthetics
- To encourage the entrepreneurs to develop geosynthetics indigenously by providing know how and developing samples at BTRA pilot plant

Apart from testing & development, BTRA provides training to users / entrepreneurs in Geotech as well as in other fields of technical textiles. Also consultancy including DPR preparation, is provided to entrepreneurs to support establishment of new manufacturing facilities for geosynthetics.

BTRA has setup a new Geotech Laboratory with all testing facilities to test Geotextiles, Geomembranes, Geocomposites, Gabions, Geosynthetic Clay Liner, Geogrids, Prefabricated Vertical Drain etc. BTRA is also strengthening its information resources on Geotech by procuring various books and international test methods such as ASTM, INDA, EDANA, ISO, etc. This Geotech laboratory is accredited per the following:

- GAI-LAP Accreditation of Geosynthetics Institute, USA
- ISO/IEC-17025:2005

Infrastructure Facilities

Testing Instruments

Testing equipment (procured under COE):

Sr.No.	Name Of Equipment	Model/type/ year of make	Range & Accuracy
1	Universal Testing Machine	H300KU Tinius Olsen 2008	300KN 1%
2	Peel Bond Tester	1kN Tinius Olsen 2008	1 KN 1%
3	Melt Flow Indexer	AC type Stop watch LSW-72 International Equipments	Temp. up to 400 oC + 0.1oC
4	ESCR	Controller -VT 4826 International Equipments	Temp. 100 oC +0.1 oC
5	Carbon Black Content Tester	Controller -VT 4826 International Equipments	Temp.up to1000oC Rotameter 2.0 LPM
6	Porometer	Quantachrome, 3Gz, USA	1 to 250 microns + 0.01 micron
7	Particle Size Analyser	Malvern Master Sizer 2000	0.02 to 2000 microns + 0.01 micron
8	Water Vapour Transmission Rate Tester	TextTest FX 3150 Gravitest	Air flow +0.01m/sec Weight +0.1mg Humidity + 0.1 % Temp +0.1 oC
9	CBR Puncture Test Apparatus	Aimil	Max. stroke 150mm
10	Index Puncture Test Apparatus (Pneumatic)	Tinius Olsen	Max. stroke 50mm
11	Air permeability Tester	Qualitest-Frazier	Up to 500 LPM
12	Thermal Conductivity Tester	Laser Comp	Product up to 100 mm max
13	Pneumatic press (with cutting dies)	Pneumatic Dumbell Cutter	Capacity 1 Ton
14	UV Weatherometer	Q-Sun	–
15	Profile Projector	Sipcon / SVI-IMG MSU 3D	30 x to 200x
16	Hydrostatic pressure head tester	Mesdan	Water head up to 100cm
17	Upgradation of DSC	HP	Up to 1000oC
18	Martindale Abrasion tester	James & Heals	–
19	Stress Cracking Resistance Tester	WIRA	Temp 50 & 100 oC + 0.1oC
20	Pyramid Puncture Tester	Tinius Olsen	Capacity 5 Ton
21	Dry powder analyser	Malvern	0.02 to 2000 micron
22	Filtration efficiency tester	--	--
23	Hydraulic transmissivity tester	BT Technology	--
24	Soil Geotextile Clogging potential Tester	BT Technology	-

Test equipment expected (under COE):

1	Water permeability under load		
2	Vertical strip drain tester in crimped condition		
3	Filtration efficiency tester		
4	Multi axial tension tester		

Additional Test equipment for Geosynthetic testing (Procured by BTRA):

1	Instron	4206	50kN +1 %
2	Cone Drop Tester	BTRA	2 to 50 mm + 2 mm
3	BTRA Thickness Tester	BTRA	10 mm + 0.01 mm
4	Water Permeability Tester	BTRA	Flow rate 1 to 30 LPM +0.1 LPM WH up to 100 mm
5	Digital Density Balance	ER200A Afcoset	up to 100 g + 0.0001 g density from 0.88 to 22 g/cc
6	Digital Bursting Strength Tester	Qualitest QC115D	Up to 60kg/cm2 + 0.1kg/cm2
7	SDL Thickness Tester	SDL Carpet thickness gauge	Thick 0 to 25 mm +0.01mm Pressure 2 to 200kPa
8	Index Puncture Test Apparatus (mechanical)	BTRA	Max. stroke 50mm
9	Digital Platform Scale	CS 100 CITIZEN	Up to 100 kg + 20 g
10	Sieve Shaker	C. Abhaykumar	–

Geotech COE Equipment Installed at ATIRA

1. Instron make UTM, 50 KN
2. ATLAS Weather-o-meter
3. Mettler Balance
4. Pull out Test Device
5. Thickness Gauge
6. Global UV Test System

Images: Geotech COE Equipment at BTRA

Bursting Strength Tester

Carbon Black Content Tester

Cone Drop Tester

Density Tester

ESCR

Martindale Abrasion Tester

Melt Flow Indexer

Particle Size Analyser

Peel Bond Tester

Pneumatic Press

UTM (Universal Testing Machine)

Profile Projector

Thickness Testers

Thermal Conductivity Tester

Porometer

UV Weather-o-meter

Sizing Machine

X-Ray Diffraction

Water Vapour Transmission Rate Tester

Geotech Test Parameters Supported and Corresponding Cost

The BTRA testing lab is accredited by GRI, USA as well as by NABL.

Accreditation as per ISO 17025

- International : BTRA Testing Lab is accredited by GRI, USA
- National : BTRA Testing Lab is accredited by NABL

Products tested at BTRA

- GEOTEXTILES
- GEOCELL
- GEONETS
- GEOGRIDS (Geogrid,Geomat, Geostrap)
- GEOMEMBRANES (Smooth & Texturized)
- GEOCOMPOSITES
- Geosynthetic Clay Liner (GCL)
- GABIONS (Metal & Rope)
- Turf Reinforcement Mats (TRM)
- DRAINS
  :Prefabricated Vertical Drains (PVD)
  :Geodrain

	Test Parameters	ASTM	ISO	IS	BS EN	Quantity	Cost of Test (Rs.)
1	AOS	D 4751		14294		2 M^2	600
2	Abrasion	D 4886		14714		0.5 M^2	4000
3	Bursting strength	D 3786				0.5 M^2	350
4	CBR puncture	D 6241	12236			2 M^2	1250
5	Carbon Black Content	D 1603				1 sq.ft	1200
6	Cone Drop	13433	13162-4		918	2 M^2	400
7	Density	D 792				1 sq.ft	500
8	ESCR	D 1693				1 sq.ft	1200
9	Grab Strength	D 4632	13934-2			1 M^2	1000
10	Index Puncture	D 4833				0.75 M^2	1200
11	Mass	D 5261	9864	14716		0.5 M^2	500
12	Melt flow index	D 1238				10 gm	900
13	Pore Size	D 6767				0.5 M^2	1250
14	Rope Strength			7071-4	1140	6 M	900
15	Seam strength	D 4884	10321	15060		2 M^2	1500
16	Tear Strength of geomembrane	D 1004				0.5 M^2	1200
17	Tensile strength 50mm strip	D 5035	13934-1	1969		0.5 M^2	900
18	Tensile strength of geogrid-single rib	D 6637 A				3 M^2	1000
19	Tensile strength of geogrid-multi rib	D 6637 B				3 M^2	2000
20	Tensile strength of geomembrane	D 6693				0.5 M^2	1200
21	Thickness	D 5199	9863-2	13162-3		0.5 M^2	250
22	Trapezoid tear strength	D 4533	14293			1 M^2	1000
23	UV stabilization	D 4355	13162-2		12225	1 M^2	80/hr
24	Water permeability	D 4491	11058	14324	6906-3	0.75 M^2	1800
25	2% secant modulus of geomembrane	D 5323				0.5 M^2	1200
26	Metal Gabion (size, thickness, tensile)	D 975				1 piece	1700
27	Wide width of geotextile	D 4595	10319	13162-5		2 M^2	1500
28	Wide width of geomembrane	D 4885				2 M^2	1500
29	pyramid puncture resistance	D 5494				2 M^2	2000
30	Thermal Conductivity	C 518		3144		1 M^2	2000
31	Weld strength of geomembrane	BTRA dev	. -	-	-	1m	2000
32	Horizontal pull out test	D 6706				3M^2	5000
33	Stress cracking resistance	D 5397				0.5 M^2	2000
34	Hydraulic transmissivity	D 4716				1 M^2	2000
35	Soil geotextile clogging potential	D 5101				1 M^2	2000

Incubation Centre

The following equipment is available at the incubation centre to support innovation and the development of new products and processes :

1. Nonwoven pilot plant
    - Needle punching & Hydro entanglement nonwoven (for geotextiles & others) for width 500mm

2. Plasma processing plant
   - For product development using plasma technology
   - Woven geotextiles
   - Max. width 500 mm
3. Sample Loom : CCI (Dobby) computer operated with mini sizing & warping
   - Machine and drawing-in machine
   - Any design with different coloured yarns is possible
   - Its fast & economical process to develop woven geotextiles
   - Various types of fibres can be processed

Needle Loom

Warping Machine

Plasma Processing Unit

Information Center

Books & CDs Procured

- Coated textiles - principles & applications
- ASTM-STP1190
- ASTM-STP1379
- Ullmann's fibres [vol. 1 & 2]
- High performance fibres
- Military textiles
- 3D fibre reinforced polymer composites
- Friction in textile materials
- Composites forming technologies
- Guide specifications for geotextiles in separate applications
- Worldwide outlook for the nonwovens industry [2007-2012] / india nonwovens outlook [2007-2012] - trends, forecasts & business strategies
- World markets for technical textiles to 2012 & strategies of leading technical textile companies
- Bridging the gap between technical textiles and fashion
- 3-D fibrous assemblies, biologically inspired textiles, structure and mechanics of textile fibre assemblies, tribology of natural fibre polymer composites
- Textile advances in the automotive industry, physical properties of textile fibres
- Properties and performance of natural fibre composites, engineering textiles
- Developments in Smart Fabrics
- Developments in Nonwovens for Personal Care
- Developments in Nonwovens for Wipes
- Developments in Nonwovens for Filtration
- Technical Textiles: Technology, Development & Applications
- Airlaid Pulp Nonwoven Primer
- Elementary Nonwovens Training DVD
- Filtration Technology Handbook
- Hydroentangled Technology Primer
- Needlepunch Nonwoven Primer
- Nonwoven Fabric Sampler & Technology Reference
- Principles of Nonwovens
- Nonwovens! What Are They DVD
- The Nonwoven Fabrics Handbook
- Spunbonded and Melt Blown Technology Handbook
- Technical Textiles Markets 5th Symposium CD ROM
- Technical Textiles Markets 4th Symposium CD ROM
- Buyers Guide for 2010
- Designing with Geosynthetics - (Hard bound book 2005 - 5th Edition), Designing with Geosynthetics Solutions Manual 2005 - 5th Edition
- GRI Standards (currently numbering 45)
- Status and Use of AASHTO M288 Geotextile Specifications
- Survey of Landfill Liner and Cover, Regulations Part 1 USA Status
- Survey of Landfill Liner and Cover, Regulations Part II Worldwide Status
- Geosynthetics in Infrastructure Remediation
- Field Performance of Geosynthetics
- Field Installation of Geosynthetics
- Lessons Learned from Case Histories
- Geosynthetics in the Future
- Bioreactors, GCLs and SRWs
- Peak/Residual, RECMs and Installation
- Probability, LFs, Poor Backfill
- MSW Properties, GT Tubes
- Geosynthetics R & D - "In-Progress"
- Koerner Symposium Proceedings
- CD-LF-K , B-Fill in Walls, Heap Leach Pads, etc.
- CD-Combating Terrorism & Natural Disasters
- CD-Agriculture & Aqua-culture
- CD-It's All in the Details
- Needle punch Conference Proceedings 2004, 2006 & 2009
- Link with India Conference Proceedings, 2007
- INTC Conference Proceedings 2004 to 2009
- Vision Conference Proceedings 2005 to 2009
- World of Wipes Conference Proceedings 2007 & 2008
- Non-woven Research Academy, 2005 To 2008
- International Non-wovens Symposium, 2006, 2007 & 2009
- Middle East Non-wovens Symposium, 2009 & 2007
- FILTREX Conference, 2004, 2006 & 2008
- OUTLOOK Conference, 2005 to 2008
- Filtrex Asia 2010
- International Non-wovens Symposium 2010
- Non-wovens Structures for Absorption of Body Fluids
- Non-wovens Booklet
- 2009 GEO conference proceedings CD
- 6th ICG proceedings Vol. 1 & 2
- Advanced landfill liner system
- Geosynthetics: How to buy, design and build retaining walls
- FHWA Manual Geosynthetic design and construction guidelines
- 2010 state of the industry report
- Advances in Geosynthetic Clay Liner Technology: 2nd Symposium [STP1456]
- Testing and Performance of Geosynthetics in Subsurface Drainage [STP1390]
- Testing and Acceptance Criteria for Geosynthetic Clay Liners [STP1308]
- Geostatistics for Environmental and Geotechnical Applications [STP1283]
- Recent Developments in Geotextile Filters & Prefabricated Drainage Geocomposites [STP1281]
- Dynamic Geotechnical Testing II [STP1213]

- Geotechnical Engineering of Ocean Waste Disposal [STP1087]
- Geosynthetic Testing for Waste Containment Applications [STP1081]
- Geotechnics of Waste Fills Theory and Practice [STP1070]
- Geotextile Testing and the Design Engineer [STP952]
- Composite Materials: Testing and Design (13th Vol) [STP 1242]
- Geosynthetics in civil and environmental engineering
- Introduction to Non-wovens
- Non-wovens: theory, process, performance and testing
- Technical needs: Non-wovens for medical/surgical and consumer uses
- Geosynthetics Asia 1997
- Geotextiles, Geomembranes and related products [vol. 1, 2, 3]
- Geotextiles in filtration & drainage
- Filtration conference [2003, 2005, 2006, 2008]
- IDEA [2004, 2007] Proceedings
- Geotechnical aspects of landfill design and construction
- Final covers for solid waste landfills and abandoned dumps
- Waste containment facilities
- Hitech fibrous materials
- Construction and geotechnical methods in foundation engineering
- Construction and geotechnical engineering using synthetic fabrics
- Durability and aging of geosynthetics
- Geosynthetic resins, formulations and manufacturing
- Soft soil stabilization using geosynthetics
- Video 'Geosynthetics in Transportation Applications'
- Video 'Geosynthetics in Reinforced Soil Structures'
- Video 'Geosynthetics in Landfills'
- CD Geosynthetics and environmental engineering
- CD Retaining Structures with Geosynthetics
- Durability of geotextiles

Standards Procured

- AASHTO M 288
- ASTM-C1338:2000
- ASTM-D2020:1992(03)
- ASTM-D2574:2006
- ASTM-D3273:2000(05)
- ASTM-D5590-2000(05)
- ASTM-E1428:1999(04)
- ASTM-E2180:2007
- ASTM-E96/96M:2005
- BS DD CEN/TS [14416, 14417, 14418]
- DIN EN [12226, 12447, 13719, 13738, 14030, 14150, 14196, 14414, 14415, 14574, 14575, 14576]
- DIN HANDBOOK 385
- DIN-EN-1644-1:1997
- DIN-EN-1644-2:2000
- DIN-V53160-1:2002
- ISO/TS 13434:2008
- ISO-10318:2005
- ISO-10319:2008
- ISO-10320:1999
- ISO-10321:2008
- ISO-10722:2007
- ISO-12236:2006
- ISO-12957-1:2005
- ISO-12957-2:2005
- ISO-12958:1999
- ISO-13426-1:2003
- ISO-13426-2:2005
- ISO-13427:1998
- ISO-13428:2005
- ISO-13433:2006
- ISO-13437:1998
- ISO-13935-2:1999
- ISO-25619-1-2008
- ISO-25619-2-2008
- ISO-3071:2005
- ISO-3759:2007
- ISO-4920:1981
- ISO-5978:1990
- ISO-6330:2000
- ISO-9863-2:1996

Journals Subscribed

1. Future Materials
2. Geosynthetics International
3. Geotechnical Testing Journal
4. Geotextiles And Geomembranes
5. International Dyer
6. Journal Of The Textile Institute
7. Textile Progress
8. Smart Textiles And Nanotechnology
9. Technical Textile International
10. Technical Textile Markets
11. Technical Textiles
12. Textile Research Journal
13. World Textiles

Technical Manpower

Names of technical personnel & field of specialization:

1	Dr. A. N. Desai	Ph.D in nonwoven Field of specialization: nonwoven & technical textiles Experience: 31 years
2	Mr. Venkatrayan	MSc. Field of specialization : Consultancy in Lab Accreditation, Total Quality Management, Lead Assessor for NABL Audit. Over 35 years experience in all aspects of textile testing and Certification / accreditation & quality management .
3	Mr. V.K.Patil	LTM , VJTI Field of specialization: nonwoven & technical textiles, development of products, No. of technical papers presented: 6 No.of publications : 32 Experience: 31 years No. of project handled : 8
4	Mr. Rajit Menon	B.Sc (Chemistry) Experience: 19 years in testing of technical textiles
5	Mr. G.R.Mahajan	LTM , VJTI Testing of geosynthetics Experience: 2 years in testing of technical textiles & Manufacturing 14 years

List of Standards and Specifications Formulated

Specifications Finalized

1. Specifications of geosynthetics for highways
   - 1.1 Geotextile for Reinforcement applications
   - 1.2 Geotextile for Seperation purpose
   - 1.3 Geotextile for Filtartion purpose
   - 1.4 Geotextile for drainage applications
2. Specifications of PVC geomembrane (IS 15909) for water proofing lining purpose for use in canal, ponds, reservoirs, industrial effluents & roofing
3. Specifications for coir bhoovastra (IS 15869)

Specifications under preparation

Draft standard prepared

1. Specifications for geogrid used as soil reinforcement in mechanically stabilized earth(MSE) retaining structures
2. Specifications for geogrid used as reinforcement of base and sub-base layers in pavement structures
3. Specifications for geotextile used in pavement overlays
4. Specifications for geotextile used as protection (or cushioning) material

Revision

Jute geotextile-part 1 for strengthening of sub grade in road (IS 14715)
Part 2 for control of bank erosion in rivers & waterways (IS 14715)

Proposed draft for :

1. Specifications for geotextile used in sub-surface drainage application
2. Specifications for geotextile for permanent erosion control in hard armor system
3. Specifications for geotextile used in sub-grade separation in pavement structures
4. Specifications for geotextile used in sub-grade stabilization in pavement structures

Test standards finalized :

1. Determination of water permeability normal to the plane, without load
2. Determination of the characteristics opening size
3. Determination of water flow capacity in their plane
4. Static (CBR) puncture resistance
5. Apparent opening size by wet sieving

Test standards under review :

Test method for the determination of the filtration behaviour of geotextiles under turbulent water flow conditions

Geotextiles and Geotextile-related products- Determination of water permeability characteristics normal to the plane, under load

Draft standards formulated by COE & submitted to BIS

Sr. No.	Test method	Title / test
1	ASTM D 1987	Biological clogging of geotextile
2	ASTM D 4632	Grab breaking strength & elongation
3	ASTM D 4594	Effect of temperature on stability of geotextile
4	ASTM D 5322	Chemical resistance of geosynthetics to liquids
5	ASTM D 6706	Pull out resistance
6	ASTM D 5493	Permeability of Geotextile under Load
7	ASTM D 6574	Hydraulic Transmissivity

Sr. No.	Test method	Title / test
8	ASTM D 5970	Geotextile deterioration from out door exposure
9	ASTM D 6693	Tensile properties of geomembrane
10	ASTM D 4833	Index puncture
11	ASTM D 5397	Stress cracking resistance of Geomembrane using notched constant tensile load test
12	ASTM D 6767	Pore Size Characteristics of Geotextiles by Capillary Flow Test
13	ASTM D 5818	Installation Damage of Geosynthetics
14	ASTM D 6637	Tensile strength of geogrid
15	ASTM D 5747	Chemical Resistance of Geomembranes to Liquids
16	ASTM D5494	Pyramid Puncture Resistance of Geomembranes
17	ASTM D 5596	Dispersion of Carbon Black in Polyolefin Geosynthetics.
18	ASTM D 4885	Performance strength of Geomembrane by wide width tensile strength method
19	In house	Determination of Weld strength of Geocell
20	ASTM D 5323	Determination of 2 % Secant modulus for polyethylene geomembrane

List of manuals prepared:

1. Geotextile in Roads

R & D Projects on Technical Textiles undertaken / under progress

i. Development of geotextile (natural & synthetic fibres) for various clients. (completed)
ii. Development of Filters for various clients (completed).
iii. Design & development of creep rupture tester as per ASTM D 5262 (completed).
iv. Development of protective nonwoven (completed).
v. Development of woven geotextile (under progress).

Training programs offered by COE

Training in Nonwovens & Geosynthetics given to 70 persons so far.
Training modules :

- Technical Textiles
- Nonwovens
- Geosynthetics

Foreign collaboration details

Collaborated with foreign Institutes / organsation:

- FITI (Testing Laboratory – GRI, USA accredited), South Korea
- GRI (Geosynthetic Research Institute), USA
- BTRA is a member of IGS (International Geosynthetic Society), USA
- BTRA is a member of EDANA, Europe
- BTRA is a member of INDA, USA
- BTRA is a member of AATCC, UK

Type of Technical Consultancy Provided/Offered

The Geotech COE provides the following specialized consulting services:

- Development of Nonwoven Geotextiles
- Development of Nonwoven composite canal liner
- Woven geotextile
- Other technical textiles Under progress

Details of prototypes developed in COE

- Woven geotextile
- Other technical textiles Under progress

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5. COE on Meditech

Lead: South India Textile Research Association (SITRA)

Background and Information of Parent Organization(s)

The Centre of Excellence on Medical Textiles is led by the South India Textile Research Association (SITRA). The first phase of the COE implementation also saw involvement from the AC College of Technology, Chennai.

South India Textile Research Association (SITRA)

SITRA was established in the year 1956 by the textile industry with support from the Ministry of Textiles, Government of India. SITRA is governed by Council of Administration consisting of members from the textile industry, representatives from Ministry of Textiles, Government of India, representatives from Government of Tamil Nadu, scientists from reputed institutions and Directors of other Textile Research Associations.

The total membership of SITRA now stands at about 280, covering about 330 units. This includes 11 mills from 8 foreign countries namely Sri Lanka, Malaysia, Nepal, Thailand, Iran, Nigeria, Bangladesh and Indonesia. SITRA's services are also utilised by about 77 small units under the technical service card holder's category. Further SITRA offers services through 7 power loom service centers, one textile service center, 4 CAD centers, one jute promotion center and one sample collection center.

AC College of Technology, Anna University, Chennai

AC College of Technology has been at the forefront of textile education in the country since 1945 and was the first institute to offer degree programmes in textile technology. It offers undergraduate, post graduate and research programmes in the areas of spinning, weaving and technical textiles.

Infrastructure Facilities

The COE is equipped with the following equipment to support the industry's needs:

Testing Instruments

S.No.	Name of the Instrument	Photograph of Instrument	Make	Model	Description
1.	Lister AC & Wet Back		Lenzing Instrument	-	To determine liquid strike through & wetback of the non-woven
2.	Upgraded Instron		Instron	Model 6021 with 5500 R	To test the tensile properties of all kinds of Meditech products
3.	Sweating GuardedHot Plate		SDL Atlas	M259B	To determine Thermal resistance, Water-vapour resistance, Water-vapour transmission, Water-vapour permeability index of Meditech products
4.	Hydrostatic Head Tester		Textest Instruments	FX 3000 (Hydro tester III)	To test the water resistance of all types of fabrics, including those treated with water resistant or water repellent finish

S.No.	Name of the Instrument	Photograph of Instrument	Make	Model	Description
5.	Vertical Flammability Tester		SDL Atlas	M233M	Used for determining the ignitability of material
6.	Gas Chromatography and Mass Spectrum Detector (GC-MS)		Thermo Scientific	DSQ II (SR.No: MS 220-6340)	Used for analyzing banned aryl amine, pesticides, phthalates, alkyl phenol ethoxylates (APEO), Pentachlorophenol (PCP), Organic metallic Tin (OMT) etc
7.	Atomic Absorption Spectrophotometer (AAS)		SHIMADSU	AA-7000	Atomic absorption along with atomic emission using either flame or electro thermal atomization is widely used for analysis arsenic, selenium, mercury, tin, lead, nickel, chromium, etc can be quantified in ppm/ppb levels.
8.	High Performance Liquid Chromatography (HPLC)		Waters	C2695	Mainly used for separation technique both for volatile and non-volatile samples. -Quantifying the banned compounds i.e. Aryl amines, disperse dyes, pentachlorophenol etc...
9.	UV-Visible Spectrophotometer		GBC	UV/VIS 918	To determine the drug release in the wound dressings.
10.	Liquid Absorbency Tester & Liquid Absorbency Kit		WIRA instruments	SR.No: G102/10	To determine the sinking time & water holding capacity of the Meditech products
11.	Instrument for Run test		WIRA Instruments	SR.No: G103/10	The Run-off tester is used to measure the quantity of test liquid (simulated urine) which runs down a nonwoven test piece.
12.	Wet Barrier Tester		WIRA	G103/10	The test uses an inverted mason jar to assess the ability of a sample to withstand water Penetration by applying a constant head of liquid over a period of time.
13.	Liquid Wicking Rate		WIRA Instruments	G103/10	To determine the liquid transport in all kinds of fabric.
14.	Flushability Tester for Non-Woven Products		Lenzing Instruments Flush 100	Flush 100	To access the rate and extent of disintegration of a test material by turbulent water in a rotating tube.

S.No.	Name of the Instrument	Photograph of Instrument	Make	Model	Description
15.	Fourier Transform Infra-red Spectroscopy (FTIR)		Thermo Scientific	Nicolet IS 10	To determine the functional groups present in the materials.
16.	Microwave Digestion		Milestone	SR.No: 132122	Microwave sample preparation has become the benchmark technology in digesting samples for AAS, AES, ICP, and ICP-MS
17.	High Performance Thin Layer Chromatography (HPTLC)		CAMAG	027.6200	Useful for the analysis of banned amines and other chemicals present in the Meditech products.
18.	Moisture management tester		SDL Atlas	-	Used for the measurement of liquid moisture management properties of textile fabrics.
19.	Tensiometer		Data physics	DCAT 11	To measure the surface tension o f liquid
20.	Capillary flow porometer		PMI	CFP – 1200 A	To measure the pore size of the Meditech products
21.	Horizontal laminar airflow		Microflow	-	Used to transfer the culture in an aseptic manner. Biological evaluation of Medical Products testing for antimicrobial assessment.
22.	Incubator shaker		ORBITEK	-	Ideal for mixing and development of cultures for Antimicrobial activity of Medical Textile products like surgical gowns, face masks etc..,.
23.	ETO gas sterilizer		RUJIKON	-	-To destroy bacteria, virus & fungus present in the Meditech products -To sterilize the medical textile products.
24.	Biological safety cabinet		Micro flow	-	Cell growth area for in vitro cytotoxicity testing of medical products.
25.	Rotary Evaporator		Buchi	F-105	To extract the solvents from the medical textile samples/others to find out the desired compound analysis.
26.	Flame photometer		ELICO	CL 378	To determine the Sodium, Potassium content in the water samples from medical textile unit

S.No.	Name of the Instrument	Photograph of Instrument	Make	Model	Description
					where water is in use.
27.	BOD Incubator		ORBITEK	-	To maintain the temperature and humidity for the analysis of water.
28.	Water Purification System		SIEMENS	Ultra Clear	To purify the water for laboratory use to carry out the test parameters.

Test Parameters

Testing services offered by SITRA in the field of medical textiles:

Test Name	International standards Applied	Sample Size Required	Testing Charges in (RS)
Hydrostatic resistance	AATCC 127	½ square Metre cloth	300
Bacterial filtration efficiency	ASTM F 2101	½ Metre cloth	2500
Thermal resistance	ISO 11092	1 square Metre cloth	3000
Water-vapour resistance	ISO 11092	1 square Metre cloth	3000
Water-vapour permeability	ISO 11092	1 square Metre cloth	3000
Liquid strike through time	EDANA 150.5 & ISO 9073 - 13	½ square Metre cloth	450
Wet back	EDANA 151.2 & ISO 9073 - 8	½ square Metre cloth	200
Run – off test	ISO 9073 - 11	½ square Metre cloth	400
Flushability	-	½ square Metre cloth	500
Knot strength	-	-	400
Threads/Unit length	ASTM 3775	½ square Metre cloth with selvedge's	190
Yarn count	ASTM D 1059	½ square Metre cloth	250
GSM	ASTM D 3776/ IS 1964	½ square Metre cloth	160
Tear strength	ASTM D 1424	½ square Metre cloth	315
Tensile Strength	ASTM D 5035	½ square Metre cloth	315
Thickness	ASTM D 1777	½ square Metre cloth	65
Stiffness	ASTM D 4032/BS 3356	½ square Metre cloth	315
Pilling	IS 10971	½ square Metre cloth	315
Co-efficient of drape – Woven	BS 5058	½ square Metre cloth	315
Air permeability	ASTM D 737	½ square Metre cloth	315
Busting strength	IS 1966	½ square Metre cloth	250
Antibacterial activity assessment (Qualitative)	AATCC 147	½ Metre cloth	1200
Antibacterial activity assessment (Quantitative)	AATCC 100	½ Metre cloth	1600
Antifungal Evaluation,Qualitative	AATCC 30, Part III	½ Metre cloth	1500
Soil Burial Test	AATCC 30, Part I	½ Metre cloth	3000
Total Colony Unit	APHA – 9215B	½ Metre cloth	1500
Most probable Number of E.Coli	IS 1622	½ Metre cloth	1200
Fastness Properties			
Light	AATCC 16/IS 686/IS 2454/BS 1006	½ Metre cloth	500
Rubbing	IS 766/AATCC 8/AATCC 165	½ Metre cloth	190
Washing	AATCC 61/IS 687/IS 3361/IS 764/ IS 765/IS 3417/IS 984	½ Metre cloth	190
Perspiration	IS 790/AATCC 15	½ Metre cloth	375
Water repellency	AATCC- 22	½ Metre cloth	315
Water soluble substances	IS 3456/AATCC 97	½ Metre cloth	250
Presence of surfactants	-	½ Metre cloth	250
Residual total dissolved solids	-	½ Metre cloth	300

Test Name	International standards Applied	Sample Size Required	Testing Charges in (RS)
Sulphate content	IS 4203	½ Metre cloth	250
Ash content	IS 199	½ Metre cloth	250
Presence of fluorescence		½ Metre cloth	190
Absorbency	IS 2369/AATCC 79/IS 14579	½ Metre cloth	190
Wicking rate	-	½ Metre cloth	375
Ether soluble substances	IS 4390	½ Metre cloth	625
Overall moisture management capacity	AATCC 195	0.5 m2	1000
Antibacterial evaluation	JIS L 1902	0.5 m2	1800
Antibacterial evaluation Qualitative – carpets	AATCC 174 Part I	0.5 m2	1200
Antibacterial evaluation Quantitative – carpets	AATCC 174 Part II	0.5 m2	1600
Antifungal evaluation Qualitative – carpets	AATCC 174 Part III	0.5 m2	1500
Antibacterial evaluation Qualitative (Kirbey Bauer susceptibility)	In-house	0.5 m2	1200

Incubation Center

The following is the list of machineries procured under the Centre of Excellence to support the incubation efforts:

S.No	Name of the Machinery	Type of products that can be produced
1	Rieter JETLACE (Hydroentaglement nonwoven plant)	Wound care products, surgical gowns, different types of wipes, face masks, health care and hygiene products
2	Karl Mayer Tricot Warp Knitting Machine	Burn garments, bandages, heart valve fabric and clinical heart patch fabric, Hernia mesh
3	Compression Stockings Knitting Machine	Medical compression stockings for leg and arm
4	Core Yarn System for Ring Frame	Different types of core and cover yarns
5	Hot melt Multipurpose Laminating & Coating Pilot Plant	To produce Water proof, antimicrobial, breathable, fire proof and different kind of functional finished products
6	High Speed Shuttleless Narrow Fabric Needle Weaving Loom	Bandages like Compression, Elastic ,Crepe etc
7	Electro Spinning Apparatus for producing Nano Fibres from Polymers	Wound dressings, Filter media, Tissue Engineering etc
8	3 Dimensional Cartesian Braiding Machine	Braided suture
9	Sulzer projectile Weaving Machine	Pillow cover, OT fabric and hospital bed fabrics
10	Ultrasonic Fabric Sealing System	Edge sealing the Surgical gowns and health care fabric
11	Cotton Wool Roll Making Machine	To produce surgical cotton wool roll
12	Face mask making machine	To produce the surgical face mask

Images of the Incubation Centre Machineries

Rieter JETLACE (Hydroentaglement nonwoven plant)

Karl Mayer Tricot Warp Knitting Machine

Compression Stockings Knitting Machine

Core Yarn System for Ring Frame

Coating and laminating machine

High Speed Shuttleless Narrow Fabric Needle Weaving Loom

Electrospinning setup

Braiding Machine

Projectile Weaving Machine

Ultrasonic Fabric Sealing System

Cotton Wool Roll Making Machine

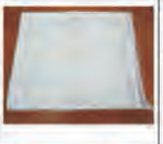
Face mask making machine

Incubation activities

- Development of post partum drape

Illustrative Meditech Products

S.No.	Product Name		Description	End Use	Manufacturers
1.	Absorbent Cotton / wool I.P.		100% bleached cotton.	Suitable for cleaning and swabbing wounds. Applications of medicaments to wounds. Economical and convenient for Clinic, Dental, Nursing home and Hospital.	The Ramaraju Surgical Cotton Mills Ltd. Rajapalayam, Tamilnadu, India. Alluvion Cotton Processing Factory, UK.
2.	Absorbent lint I.P.		100% Cotton woven, One side brushed.	Used in general surgeries.	Disha Surgicals (P) Ltd, Meerut , India. Global Veterinary Products, Australia.
3.	Ankle binder		Knitted fabric.	Adjusts and fits the ankle firmly. Stretched knitted material allows for targeted compression and support to sprained ankles.	Gel O Kare, Lucknow, India. Anping County XuDa Hardware Wire Mesh Co., Ltd., China.
4.	Anti embolism stocking		80% Nylon and 20% Elastane Knitted fabric.	Immobile patients. Pre, intra, post operative bed ridden patients.	Web cot, Aluva, Kerala. Manifattura Calze Ci-Zeta Srl, Italy.
5.	Arm sling pouch (adjustable)		Cotton fabric with Nylon straps.	Effective support to the left/right arm during recuperation from fracture, sprain, strain or surgery.	Viccos Ortho Aids, Delhi. Fortuna International Ltd., UK.
6.	Baby soft dry care (Diaper)		PP spun bond, Wood pulp with SAP, PE spun bond.	Absorbs urine very fast and retains it.	Huggies, India. Pamper, UK.
7.	Bamboo Bandage		100% Bamboo, Plain Weave.	Used as Wound Dressing.	Developed by SITRA.
8.	Barbed Bi – directional surgical sutures		Polydioxanone monofilament & Monocryl monofilament barbed sutures.	Biomaterial for wound closure and tissue approximation. *In Vitro Tendon Repair.* *In Vivo Wound Closure* .	Developed by SITRA.
9.	Compression Stockinet		Cotton and Synthetic Knitted.	Used in orthopaedics & others.	Shashi International, Kanpur, India. Anji Yuandong Medical Products Co., Ltd. China.
10.	Cotton crepe bandage B.P		100% Cotton, Woven.	General Surgical, Orthopaedic and sports injuries. Extremely convenient as a pressure dressing and for skin grafts. Can be used for sprains, aches dislocation, painful joints,	Dynamic Techno Medicals (P) Ltd, Aluva, Kerala. KOB Medical Textiles, TN, India. Fortuna International Ltd, UK.

S.No.	Product Name	Photography	Description	End Use	Manufacturers
				veins, cramps, skin injuries to tendons and muscles. Very useful as a light compression bandage for muscular support.	
11.	Disposable surgical face mask		SMS PP Nonwoven.	To protect from blood borne pathogens.	Thea-Tex, Maharashtra, India. Bosung Industrial Co., Ltd. South Korea.
12.	Elastic abdominal binder		Nylon with Elastomer.	Support the weakened abdominal wall post delivery.	Antro Care Enterprises, Chennai, India. Biomedical Horizons, Inc., USA.
13.	Elastic tubular bandage B.P		Cotton with Elastomer, Knitted.	Muscular pain, sprain, strain and swelling.	Dr. Sabharwals Mfg. Labs Limited, Kanpur, India. JetNet Corporation, USA.
14.	Elastic tubular fabric for knee support & ankle support		Heat resistant rubber and High quality yarn.	Provides firm support for weak ankle and helps to prevent and treat stress injuries. Used in sports.	Vespas Orthotics Industries, Haryana, India. Champ, Pune, India Yanmao, China.
15.	Elbow Support		100% Cotton Knitted.	Provides support and compression to the elbow and surroundings. Release pain, reduces swelling.	Champ, Pune, India. Yechun, China.
16.	Heart patch (knitted fabric)		100% Polyester, Warp Knitted.	To rectify ventricular septal defect.	Developed by SITRA.
17.	Heart valve fabrics		100% Polyester, Warp Knitted.	Covering fabric for heart valve.	
18.	Hernia mesh		PP warp knitted structure.	Quite strong and effectively repair hernias Completely.	
19.	Insoles/Liners for Diabetic Shoes		3-D spacer fabric.	Reduces the Risk of lesions on the lower extremities of foot. Pressure release & soft bedding of the foot.	
20.	Leno gauze		100% cotton Leno weave.	Wound dressing application.	Kulkarni Weaving Mills Pvt. Ltd., India. Nantong Flexitex Co., Ltd., China.
21.	Lumbar sacral support		Sewn with unique combination of virgin elastic, durable fabric	Back pain, postural muscle imbalance in the Spine. Post discetomy syndrome. Slight joint loosening in the	Antro Care Enteprices, Chennai, India. HK siwei medical instrument Co.,Ltd., Taiwan.

S.No.	Product Name	Photography	Description	End Use	Manufacturers
			material with foam and soft cotton inner lining.	lumbar Spine.	
22.	Poly glycolide violet sutures		100% Polyglycolide Acid- Braided & Coated.	Implantable surgical sutures.	Sutures India Private Limited, India. Dynek (P) Ltd, Australia.
23.	Prosthetic bifurcated vascular graft		100% Polyester, Tubular Woven Fabric.	Replacement of cardio vascular system.	Developed by SITRA.
24.	Ribbed cotton stockinette B.P		Tubular rib knitted. 100% cotton	As sterilisable stockinette for surgical incisions. As stump socks for amputees wearing prosthesis.	Shashi International, Kanpur, India. Anji Yuandong Medical Products Co., Ltd., China.
25.	Soft cervical collar		High density PU foam, cotton stockinet covering.	Cures cervical spondylolysis, neck sprain/stiff neck.	Viccos Ortho Aids, Delhi. HK siwei medical instrument Co.,Ltd., Hong Kong.
26.	Surgical gown fabric treated with Nano antimicrobial finish		100% cotton.	Surgical gown worn by surgeons.	Developed by SITRA
27.	Surgical gown fabric treated with Nano liquid repellent finish		100% cotton	Surgical gown worn by surgeons.	Developed by SITRA
28.	Sutures		Nylon, Braided structure.	Closure for wounds.	Arasan phosphates (P) Ltd, TN, India. STARMEDIX, USA.
29.	Tennis elbow support		Cotton, PE, Nylon, PP and Ethafoam PU.	Preventive or non surgical care.	Samson Scientifics and surgical, Indore, India. F3 Sports Inc., USA.
30.	Varicose vein stoking		Woven by circular looms, Nylon and Spandex Yarn. Gives four way stretching,	Controlled compression to the legs to squeeze away abnormal back flow of blood	Samson scientific and surgical, Indore, India. Yiwu Yinhong Healthy&Sports Article Co., Ltd., China.
31.	Wrist splint		Made of strong and porous, high quality elastic.	To maintain wrist in functional position. Resting splint for arthritis.	Dynamic Technomedicals (P) Ltd, Aluva, Kerala. Jiangsu Reak Healthy Articles Co., Ltd., China.

	Product Name		Description	End Use	Manufacturers
32.	Adhesive wound dressing		Nonwoven material with adhesive coat	Used for acute wound	3M India, Bangalore.
33.	Absorbable surgical sutures mersutures		Catgut	Used for wound closure	Ethicon
34.	Absorbable surgical sutures monocryl		Poliglecaprone	Used for wound closure	Ethicon
35.	Absorbable surgical sutures vicryl		Polyglatic acid	Used for wound closure	Ethicon
36.	Adhesive bandage		Weaving & Coating	The bandage is applied such that the pad covers the wound, and the fabric or plastic sticks to the surrounding skin to hold the dressing in place and prevent dirt from entering the wound.	Johnson & Johnson
37.	Adhesive tap		Made of cotton treated with zinc oxide	Fixation of Dressing	BIERSDORF India Pvt Ltd
38.	Adult incontinence pad		Spunbond nonwoven & SAP	Incontinence pad can be used by men and women to absorb urine	Stayfree, USA. Actifit Hygiene concepts, India
39.	Alcohol swabs		70% isopropyl alcohol	Alcohol swabs can be used to clean the injection site, to wipe clean the surface used to prepare for injection.	RD industries, Delhi
40.	Ankle brace		Designed to be worn comfortably inside laced shoe. Controls abduction and adduction while allowing flexion and extension.	Prevention of ankle injuries during sports and normal activities To protect ankle in the case of ligament tears, and hairline fractures Post operative use and early cast removal	Apothecaries Sundries Manufacturing Co. New-Delhi, India.
41.	Ankle support		Knitted structure	Protection of ankle joint against sprains in sports and during normal activities. Post-operative rehabilitation	MGRM, Hyderabad
42	Anklet		Neoprene for uniform compression. Velcro closure for secure application.	Mild sprain & strain. Ligaments injuries. Preventive care for sports activities.	Apothecaries Sundries Manufacturing Co. New-Delhi, India. Grip Rehabilitation pvt.ltd, India.
43.	Baby wipes		Spunlace nonwoven, Alovera treated	Primarily used for wiping infants backsides in diaper changing	Himalaya, Mysore

S.No.	Product Name	Photography	Description	End Use	Manufacturers
44.	Bath wipes		Spun lace, Pure water, Aloe Vera Extract	Used as a cleaning and moisturizing disposable cloth for patients.	Prime fortune co., ltd
45.	Callus removal pad		Salicylic acid, Polyvinyl alkyl, ether adhesive, Tio2, Liquid paraffin, Thiophenol antioxidant	Targeted medicated action for the safe and effective removal of calluses.	TTK Ltd, Amrutanjan
46.	Capsium plaster		Woven, Capsium oieoresin I.P coated on one side	To relieve pain and reduce counter itching in patients.	Precision coatings (P) ltd
47.	Cast padding		Viscose nonwoven	Used where swelling is expected. Used before application of any type of bandages to protect the skin	MEDRAD INC, Bangalore
48.	Cast shoe		Polyvinyl, Polyester, Polyurethane and Polyamide.	Cast shoe replaces the functions of the normal shoe when patient is on plaster cast of the foot. Prevents excessive wear & tear of the cast and reduces impact on the injured foot.	Tynor Orthotics Pvt Ltd, Vissco Rehabilitation Aids (P) Ltd
49.	Cervical collar with chin support		Made from high density Polyurethane foam, Bonded with plastic moulded support, Exterior covered with soft cotton knitted fabric to absorb perspiration and provide cool and comfortable support	Provide comfortable immobilization without the harsh uncomfortable firmness	Vissco Rehabilitation Aids Pvt Ltd
50.	Cervical Immobilizer		Two piece design – Easy application / Adjustable X-ray lucent – Allows X-ray to be taken without removing the collar Anterior tracheal opening – Provision	Post cervical surgery Severe cervical sprain Cervical fracture Cervical disc herniation	Dynamic Techno Medicals Pvt. Ltd, India. Apothecaries Sundries Manufacturing Co. New-Delhi, India.

S.No.	Product Name	Photography	Description	End Use	Manufacturers
			for emergency tracheotomy and provides access to carotid pulse		
51.	Chlorohexidine gauze dressing		Gauze weave and coated with Soft paraffin wax B.P, Chlorhexidine acetate	Primary wound dressing for burns, ulcers, skin grafts and other injuries.	BSN medicals
52.	Cock up splint		Made of Light metal maintains dorsi flexion Constructed of high quality fabric with soft padding with two sets of buckle and velcro gives proper immobilization and easy application	Indicated for minor fractures of the wrist & distal forearm, early cast removable or strain and sprain in the wrist.	Royal chemists, India Gst corporation, India
53.	Collagen wound dressing		Collagen impregnated Nonwoven	Used as a dressing for burns & wounds.	Cologenesis HealthCare Products P.Ltd, Salem, Tamil nadu
54.	Combine dressing surgical pad		Pad of Absorbent cotton in an absorbent over warp sterilised	Combine dressing pad where high absorbency is required to handle heavy drainage, promote healing and keep the wound dry.	Kornish surgical Industries, Ahemadabad
55.	Compression stockings (Mid thigh)		Nylon, spandex and rubber, Circular weaving	Compression Stockings provide controlled compression to the legs to squeeze abnormal back flow of blood towards the heart. They provide requisite pressure to the superficial affected veins.	Tynor orthotics Pvt Ltd
56.	Contoured lumbo scaral support		Made of a special breathable elastic material.	Helps to relieve lower back pain or can be used simply whenever additional support is called for.	Vissco rehabilitation Aids Pvt ltd
57.	Corn caps		Normalic amal, gandaviroja, oilment base	Corn Caps works by loosening the "cement" holding the hardened skin together and loosening the nucleus, to allow for clean removal. The soft felt corn ring also helps it relieve	Amrutanjan

S.No.	Product Name	Photography	Description	End Use	Manufacturers
				pressure from the corn.	
58.	Cotton pads		Cotton	Cotton pads are used to stop or prevent bleeding from minor punctures such as injections etc	Bella premier happy hygienic care Pvt Ltd, Dindigul
59.	Cotton ball		Cotton fibre	Make-up remover and cleaning the injected site with isopropyl alcohol.	Bella
60.	Cotton and rubber elastic bandage		Woven, material used - cotton	Elastic bandages are also used to treat bone fractures. Padding is applied to the fractured limb, then a splint (usually plaster) is applied. The elastic bandage is then applied to hold the splint in place and to protect it.	Dynamic techno medical Pvt Ltd, Aluva, Kerala
61.	Cohesive bandage		Generally made of elasticized yarn and latex, a cohesive bandage is lightweight and flexible, contouring to the part of the body on which it is being used.	A cohesive bandage is one of the most common materials found in a first aid kit. Used in sports such as football, soccer, tennis and golf, a cohesive bandage is ideal for taping the joints to provide more support to what may be an already weakened area	3M Health care
62.	Diabetic silver socks		78% Aeromax cotton, 12% Elastane & 10% silver yarn	Protection and care while at work & play Eliminates odour causing bacteria and athletes Foot fungus	Dynamic techno medical Pvt Ltd, Aluva, Kerala
63.	Diclofenac transdermal patch		Diclofenac diethylamine dipped nonwoven.	For relief of pain and inflammation.	Sparsha Pharma International Pvt Ltd
64.	Disposable large sheet		Polypropylene nonwoven	Used as a barrier fabric in surgeries.	Mediprro, coimbatore
65.	Disposable trolley sheet		Polypropylene nonwoven	Used as a trolley cover in operation theatre.	Mediprro, coimbatore
66.	Ear cleaning buds		Cotton fiber	Cleaning ears	Bella, Johnson & Johnsons limited
67.	Elastic adhesive bandage		Cotton Crepe weave, Zinc oxide adhesive coating on one side	It provide compression support for joints during high-stress sport activity. Minimise swelling and provide additional support as an over	Alves Healthcare Ptd, Johnson & Johnsons Ltd

S.No.	Product Name	Photography	Description	End Use	Manufacturers
				wrap. Porous adhesive, allowing the skin to breathe for maximum adherence.	
68.	Elastic knee support		Ventilated cotton backed elastic which allows air flow.	For semi knee immobilisation For flexibility as well as rigidity in support Post-operative knee problems Protection against abrasions and impacts	Vissco Mumbai – India. Apothecaries Sundries Manufacturing Co. New-Delhi, India.
69.	Elastic shoulder immobiliser		Woven	Lightweight, sleek and smart design to provide immobilization in shoulder dislocation and post operative rehabilitation. It reduces abduction and arm rotation by positioning the arm close to the body.	Tynor Orthotics Pvt Ltd
70.	Elastic tennis elbow support		The elastic provides compression and support Hook and loop fasteners facilitate different degrees of tension.	To protect and support elbow with compression Used in Tennis elbow, golfers elbow, thrower elbow, tendonitis and for any soft tissue tears and injuries.	Vissco Mumbai – India. Apothecaries Sundries Manufacturing Co. New-Delhi, India
71.	Elastic wrist band		Knitting	Treatment for Strain and sprain in the wrist. Minor fractures of the wrist and distal forearm	Vibash Coimbatore Surgicals Pvt Ltd
72.	Elastic wrist splint		Made of High modulus of elasticity yarn	Elastic Wrist Splint is designed to immobilize and provide firm support to hand and wrist in various orthopedic conditions. It maintains the wrist in the dorsi flexion functional position while allowing full range of motion to fingers and thumb.	Vissco
73.	Finger splint		Foam	Keeps the finger immobilized in straight position. Used for Fingertip injuries, Nail bed injuries, Burns care etc.,	MGRM Medicare Ltd, Samson Scientifics & Surgicals
74.	Gelatin sponge		Absorbale gelatine base foam, sterilised with gamma irradiation	Holds many times its weight in blood Completely absorbed within four to six weeks These Sponges can be implanted during surgery and	Sri gopalkrishna labs Pvt Ltd, Mumbai

S.No.	Product Name	Photography	Description	End Use	Manufacturers
				will be completely absorbed within four to six weeks.	
75.	Gynaec universal binder		The binder is made from cotton based fabrics and elasticared pressure is added on the rear and on the sides. The binder is designed to fit the entire abdomen and will not restrict the movement when worn.	The support provided lifts and carries the extended abdomen, relieving strain on the muscles and diaphragm. The binder helps restore the displaced internal organs to their proper position without squeezing and cramping.	Vissco rehabilitation Aids Pvt ltd
76.	Hand kerchiefs		Nonwoven	This is disposable nonwoven Handkerchief using for washing face or wiping hands.	Bilt
77.	Hand strips and label adhesive		Nonwoven and film	Used as a fixture for catheter hub. Transparent and vapour permeable.	Smith & Nephew
78.	Hard cervical collar		Two piece design for height adjustment Air vents allow better air circulation Velcro closures for easy application and removal	Moderate to severe Cervical sprain Degenerative or inflammatory diseases of the cervical spine such as spondylosis and spondylolisthesis Torticollis	Dynamic Techno Medicals Pvt. Ltd, India. Apothecaries Sundries Manufacturing Co. New-Delhi, India
79.	Hemostat		Oxidised regenerated cellulose sterlised	It is used to stop bleeding	Johnson & Johnson
80.	Hollow fibre dialyser		Membrane material: polysulfone Membrane	Excellent Small Molecule and Exceptional Middle Molecule Clearance	Jiangsu Lengthen Life Science And Technology Co., Ltd. China Gambro AB, Sweeden
81.	Humerus brace		Woven Laminated foam and metal splints.	Early cast removal in case of Humerus fractures. To splint stable, mid-shaft fracture of Humerus	MGRM Medicare Ltd
82.	Hydrocolloid occlusive dressing		Film	Used as a wound dressing. Protect wounds from bacteria's, pollution and captures wound malodors.	3M India

S.No.	Product Name	Photography	Description	End Use	Manufacturers
83.	Insect repellent wipes		Active Ingredient– DEET (Diethyl metatolumide) Wet Wipe Material—Non woven spunlace with 45gsm	To protect from mosquitoes, biting flies, ticks, gnats, no-see-ums and chiggers. Easy to use wipe application Pleasant Experience Safe and Effective	CareNow Medical Pvt. Ltd, Coimbatore Tamil Nadu, India
84.	Knee brace long		Made up of water proof cloth outer covering and soft inner cotton lining for firmness and comfort. Spring Steel Bars for immboilisation and straightening. Elastic tape with Velcro Enclosures for easy application and removal. The two way elasticized stretch materials provide both support and compression.	Protecting the injured knee joint in emergency. Stabilising surgically or non surgically treated knee	Ostwal agencies, new delhi, India. Tynor orthotics limited, India.
85.	Knee cap		Knitting	Compression and support to prevent mild strain and sprain. To control painful knee movements in the case of arthritis	Samson Scientifics & Surgicals
86.	Knee cap open patella		Made from high quality nylon, interlocking weave and single spiral elastic yarn, double layered	Uniform compression even on uneven limb surface. Warmth improves healing. Provides firm support and gentle compression.	•Tynor orthotics pvt ltd, India. •Track manufacturing Co.Pvt.Ltd
87.	Knee high stockings		Complex stitch in tips of compression Softer and non protruding wear feeling. Non pressure knit in tips and heels to create the most comfortable wear feeling.	Helps move blood and fluid that is sitting on the outermost layers of the ankle and calf to move to deeper tissues and veins, in order to allow the calf muscle, to move the blood back towards the heart and the systemic circulation.	Harvest SPF textile ltd , china JSTAR global company, Taiwan.
88.	Knee immobilizer		Has special grade malleable	Knee Surgery (Total Knee Replacement) & Knee injuries	Amron Lifestyle orthotics, India.

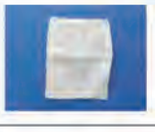
S.No.	Product Name	Photography	Description	End Use	Manufacturers
			aluminium stays Made up of soft breathable fabric Multiple Velcro for proper adjustment	might require immobilizing the knee joint. Knee Immobilizer helps to immobilize & gives proper support to the knee joint.	Norma DND products pvt, ltd, India.
89.	Knee support (Hinged)		Neoprene, Nylon, Hinge Breathable soft foam cuffs Adjustable aluminium hinges with lock Bilateral flexible wings with Velcro closure	Thermo-compression, relief, protection, stability	D.N. Products, India. Super knitting co.ltd, India
90.	Knee support plain		Knitted	It is recommended for Strain, Sprain, Pain due to Arthritis and joint enfusions	Dynamic techno medical Pvt Ltd, Aluva
91.	Ladies choice abdominal binder		Elastic, flexible metal splint, Foam fused fabrics	Maintaining cosmetic waistline for females. Compression support to the weakened abdominal wall following surgery and caesarian child birth.	MGRM Medicare Ltd
92.	Maternity compression garments		nylon and spandex yarns with a silicone blend softener	Designed for support during pregnancy. Helps manage pelvic instability and vulval variocosities.Facilitate pelvic muscle function. Improve mobility and function. Reduces pain and provides support.	SRC,
93.	Medical compression stockings		Knitted	Compression stockings are elastic garments worn around the leg compressing the limb, exerting pressure against the legs reducing the diameter of distended veins causing an increase in venous blood flow velocity and valve effectiveness.	Medi GmbH & Co,German
94.	Medical stockings (Knee high stockings)		70 % cotton, 25% Lycra & 5% Polyamide	Compression stockings are elastic garments worn around the leg compressing the limb, exerting pressure against the legs reducing the diameter of distended veins causing an increase in venous blood flow velocity and valve effectiveness.	Hindustan life care private Ltd

S.No.	Product Name	Photography	Description	End Use	Manufacturers
95.	Medical stockings (Thigh high stockings)		72% Polyamide, 28% Lycra	Compression stockings are elastic garments worn around the leg compressing the limb, exerting pressure against the legs reducing the diameter of distended veins causing an increase in venous blood flow velocity and valve effectiveness.	Hindustan life care private Ltd
96.	Medicated dressings		Extensible Permeable to air Painless when removed, even in hairy surfaces	Hypoallergenic For all minor wound Suitable for sensitive skin	Hansaplast, Indonesia. Precision coatings Pvt.ltd, India.
97.	Micropore surgical adhesive tape		Nonwoven	Securing small to medium dressings especially on damp skin. Securing lightweight tubing. Securing ostomy pouches.	3M India
98.	Mopping pad		Open weave	Used for wound dressing and general cleaning in hospitals. Heavy drainage, promoting healing, keeping the wound dry, optimal comfort and relief.	Pankajavale products
99	Nanocrystal wound dressing		Polyester coated with polypropylene mesh	Used for burn injuries.	Smith & Nephew
100	Neoprene support elbow sleeve		Woven laminated Neoprene	Provides compression, padding and warmth to the elbow region. Targeted pressure relief.	ACMC (p) Ltd
101	Neoprene support anklet		Neoprane fabric	Provides comfortable support during or after physical activity to reduce risk of injury.	ACMC Pvt Ltd, Chennai
102	Neoprene support (open patella knee brace with belt)		Neoprane material, 4 way stretch contoured design	Provides comfortable support during or after physical activity to reduce risk of injury.	ACMC Pvt Ltd, Chennai
103	Neoprene support (universal wrist wrap)		Neoprane fabric	Provides comfortable support during or after physical activity to reduce risk of injury.	ACMC Pvt Ltd, Chennai
104	Non absorbable suture ethilon		Nylon 6 monofilament	Used for wound closure	Johnson & Johnson

S.No.	Product Name	Photography	Description	End Use	Manufacturers
105	Non absorbable suture mersilk		Braided Silk	Used for wound closure	Johnson & Johnson
106	Non absorbable suture - prolene		Polypropylene	Used for wound closure	Johnson & Johnson
117	Non absorbable suture - sutupak		Braided polyester suture	Used for wound closure	Johnson & Johnson
108	Non absorbable suture Trulon		Monofilament polyamide	Used for wound closure	Sutures India Pvt Ltd
109	Non absorbable suture monocryl		poliglecaprone 25	Used for wound closure	Johnson & Johnson
110	Non absorbable suture chromic		Catgut suture	Used for wound closure	Johnson & Johnson
111	O.A Knee support		Neoprane fabric	Help support individuals who have osteoarthritis in the knee.	Tynor orthotics
112	Open woven gauze bandage		Woven	Used for wound dressing support layer.	Ramaraju, Surgicom
113	Panty liners		Nonwoven, SAP	Used for feminine hygiene. It is worn in the gusset of a woman's panties. Some uses include: absorbency for daily vaginal discharge, light menstrual flow, tampon and menstrual cup backup, spotting, post-intercourse discharge and urinary incontinence.	Johnson & Johnson, Thailand
114	Paraffin gauze dressing		Gauze weave with paraffin wax coat	Treatment of ulcers, burns, skin grafts (both donor and receptor sites) and various traumatic injuries.	Komal health care P Ltd.,
115	Patellar support		Uniquely shaped silicone pad fits over the patellar tendon Soft material is comfortable against skin and behind the knee	The patella brace is designed to provide symptomatic relief of pain and inflammation	D.N. Products, India LP supports, UK

S.No	Product Name	Photography	Description	End Use	Manufacturers
			Fully adjustable Velcro exterior for custom sizing		
116	Patella knee support		Neoprene fabric	The patella brace is designed to provide symptomatic relief of pain and inflammation	Royal Chemists Mumbai
117	Plaster		Active Ingredient – Alkaloids of belladonna	Relief from swelling pain, backache, swelling of nerves, Joint swelling	Lion, Goa
118	Plaster of paris bandage		Weaving & Coating	Used as a dressing for bone fracture and immobiliser.	Beiersdorf India
119	Pouch arm sling		Nylon, PE, PP, Ethafoam, PU	Keeping your arm immobile can aid the healing process and can minimize the pain of the injury. A broad arm sling holds your arm against your chest in a fixed position, and can be applied by using a large triangular-shaped bandage.	Tynor orthotics
120	Post- op		Nonwoven	Wound dressings	Smith & Nephew
121	Pre controlled back spilint		Polyester, Cotton, Ethafoam, Polyamide, Rubber. Woven	Support to the lumbo-sacral region. Maintaining proper back posture.	Tynor Orthotics Pvt Ltd
122	Pressure garments		Elastic garments worn for exerting pressure against the body-parts reducing the diameter of distended veins causing an increase in venous blood flow velocity and valve effectiveness.	For athletes, Oedema patients (eg. Lymphoedema) For patients with poor blood circulation For burnt parts to improve circulation	Pharmatech Distributors, New Delhi India. Technomed India (pvt) Ltd.
123	Sanitary napkin		Nonwoven, SAP	Used in mensual period.	Stay free, whisper ultra
124	Shape wear garments		Nylon/Spandex/ Cotton fabric and cotton lining. 3-Ply Fabrication: Cotton-Rubber-Cotton	Accelerated weight loss Firm compression vest Reduces waistline and flattens abdomen Corrects posture and helps relieve back pain	Insight Products, Delhi, India.

S.No.	Product Name	Photography	Description	End Use	Manufacturers
			Double hook & eye closure	For smoothing and flattening the abdomen, waist, thighs and back and for post-surgery needs.	
125	Shoulder Immobiliser		Made of Sanforized cotton Shoulder straps with padding for secure positioning Circumferential arm wrap to immobilize the shoulder Velcro closures for easy application and removal	To give support to the arm and hand along with limiting movements at the shoulder joint To immobilize the arm and shoulder joint post fractures	Dynamic Techno Medicals Pvt. Ltd, India. Apothecaries Sundries Manufacturing Co. New-Delhi, India.
126	Sling with tie		Soft foam in sleeved stockinette Plastic fastening ties for easy applications	To provide effective support without the need for additional padding	Dynamic Techno Medicals Pvt. Ltd, India. Sai pharma, India
127	SMS nonwoven gown		Polypropylene	Operation theatre apparels	Medipro
128	Surgical gown sterilised		Woven	Operation theatre apparels	
129	Spinal brace		Two rigid upright para-spinal and lateral bars of light-weight are pre-contoured to keep spine in it's natural position. Elastic abdominal panels provide the required compression. Clavicle straps with cotton stockinet covered foam pads correct shoulder posture.	Mild thoracic-lumbar injuries Herniated disc problems Post operative rehabilitation	Apothecaries Sundries Manufacturing Co. New-Delhi, India Track manufacturing co.pvt, ltd, India
130	Surgical abdominal corset		Made of cotton with sturdy elastic, which fits along the body contours	Post operative conditions of the abdomen Post umbilical and ventral hernia	Dynamic Techno Medicals Pvt. Ltd, India. Apothecaries Sundries Manufacturing Co. New-

S.No.	Product Name	Photography	Description	End Use	Manufacturers
			perfectly. Special elastic in the anterior region offers compression Foam padding for comfort fit		Delhi, India.
131	Tampons		Made of rayon, or a blend of rayon and cotton	The most common type in daily use (and the topic of the remainder of this article) is designed to be inserted into the vagina during menstruation to absorb the flow of menstrual fluid.	Bella premier happy hygiene care Pvt Ltd, Dindigul
132	Therapeutic energising stocks		The ideal pressure for reducing foot fatigue symptoms. Over the calf graduated compression stocking are effective in reducing the actual swelling and subjective feeling of heavy and tired legs.	Cramps in calf muscles. Mild oedema. Tired and aching leg. Swollen ankles. Post Plaster conditions.	Dynamic Techno Medicals, India. Avishkar international pvt, ltd, India.
133	Thigh high stockings		Complex stitch in tips of compression Softer and non protruding wear feeling. Non pressure knit in tips and heels to create the most comfortable wear feeling.	Helps move blood and fluid that is sitting on the outermost layers of the ankle and calf to move to deeper tissues and veins, in order to allow the calf muscle, to move the blood back towards the heart and the systemic circulation.	Harvest SPF textile ltd , china JSTAR global company, Taiwan.
134	Varicose vein stockings		Knitting- 80% - Polyamide 20% - Elastane	Controlled and graduated compression ensure faster return to normal circulation	Dynamic techno medicals
135	Waist reduction belt		Woven with neoprene lining	Used for reducing waist region	ACMC (p) Ltd
136	Wet wipe		Spun lace nonwoven	Face freshener	Daycare Products, Origami

S.No.	Product Name	Photography	Description	End Use	Manufacturers
137	Wrist brace with thumb		Weaving, Nylon, Polyester, Rubber materials	Nonsurgical care of sprain wrist and thumb joint	Samson Scientifics & Surgicals

Information Center

The COE on Meditech at SITRA has a comprehensive repository of books, publications, journals and relevant standards. An overview of these resources is provided below.

Books and Publications

1. Medical Textiles. Proceedings of the International Conference 24 & 25 August 1999 Bolton, UK. Edited by Prof. Subhash Anand Woodhead Publishing Limited, England. 2001. vii, 237p.
2. Medical Textiles and Biomaterials for Healthcare. Edited by Prof.S.C.Anand, Prof.J.F.Kennedy, Dr.M.Miraftab and Dr.S.Rajendran. Woodhead Publishing Limited, England. 2006. xi, 508p.
3. Smart Textiles for Medicine and Healthcare: Materials, Systems and Applications. Edited by L.Van Langenhove. Woodhead Publishing Limited, England. 2007. xiii, 312p.
4. Biologically Inspired Textiles. Edited by A.Abbott and M.Ellison Woodhead Publishing Limited, England. 2008. xxi, 219p
5. Clothing Biosensory Engineering. Edited by Y.Li and A.S.W.Wong Woodhead Publishing Limited, England. 2006. xv, 391p.
6. Biomechanical Engineering of Textiles and Clothing. Edited by Y.Li and X-Q.Dal Woodhead Publishing Limited, England. 2006. xvi, 412p
7. Biomedical Polymers Edited by Mike Jenkins Woodhead Publishing Limited, England. 2007. ix, 224p.
8. Handbook of Technical Textiles. Edited by A.R.Horrocks and S.C.Anand Woodhead Publishing Limited, England. 2000. xvi, 559p.
9. Handbook of Industrial Textiles (Wellington series). Edited by Sabit Adanur, Technomic Publishing Company, U.S.A. 1995. xx,832p.
10. Textiles for Protection. Edited by Richard A.Scott, Woodhead Publishing Limited, England. 2005. xxx, 754p.
11. Natural Fibers, Biopolymers, and Biocomposites. Edited by Amar K.Mohanty, M.Misra and L.T.Drzal, Taylor & Francis, USA. 2005. 875p.
12. Biomaterials, Artificial Organs and Tissue Engineering. Edited by L.L.Hench and J.R.Johnes. Woodhead Publishing Limited, England. 2005. xii, 284p.
13. Natural Based Polymers for Biomedical Applications. Edited Rui L.Reis et al, Woodhead Publishing Limited, England. 2008. xxv, 802p.
14. Smart Materials. Edited by Mel Schwartz, CRC Press, USA. 2009.
15. Military Textiles. Edited by Eugene Wilusz, Woodhead Publishing Limited, England. 2008. xxii, 362p.
16. Handbook of Nonwovens. Edited by S.J.Russell, Woodhead Publishing Limited, England. 2007. xiii, 530p
17. Nanofibers and Nanotechnology in Textiles. Edited by P.J.Brown and K.Stevens Woodhead Publishing Limited, England. 2007. xvi, 528p.
18. Advances in Fire Retardant Materials. Edited by A.R.Horrocks and D.Price, Woodhead Publishing Limited, England. 2008. xvi, 616p.
19. Medtex 2007 Conference Programme. The University of Bolton, Bolton, UK. 2007.
20. Nonwoven. by Madhavamoorthi, Mahajan Publishers Pvt Ltd, Ahmedabad. 2005. 342p.
21. Annual Book of ASTM Standards 2007: Volume 11.03 Occupational Health and Safety, Protective Clothing. ASTM International, USA. 2007. XVII, 487P.
22. Seminar on Medical Textiles Opportunities & Applications Office of the Textile Commissioner, Mumbai. 2008.
23. Processing of Reusable Surgical Textiles for use in Health Care Facilities. Association for the Advancement of Medical Instrumentation, USA. 2000.
24. Seminar on Woven and Knitted Technical Textiles- Resume of Papers. SITRA, Coimbatore. 2008.
25. Plasma Technologies for Textiles. Edited by R.Shishoo Woodhead Publishing Limited, England. 2007. xxx, 322p.

26.	Ecotextiles: The Way Forward for Sustainable Development in Textiles. Edited by Miraftab and Horrocks. Woodhead Publishing Limited, England. 2007. x, 221p.
27.	Use of Natural Polysaccharides in Medical Textile Applications by Fouda University of Duisburg-Essen, Egypt. 2005. 121p.
28.	Introduction to Medical Microbiology by R.Ananthanarayan Orient Longman, Hyderabad. 1984. 207p.
29.	Medical Microbiology - Volume 1 Microbial Infections by J.P.Duguid et al ELBS, Hong Kong. 1978. 666p.
30.	Medical Physics by Cameron and Skofronick John Wiley & Sons, New York. 1978. 615p.
31.	Advances in nano science & nanotechnology by Dr. Ashutosh Sharma et al. , National Institute of Science
32.	Communication and Information Resources, July 2004, 284p.
33.	Handbook of Nonwoven filter media by Mr. Irvin M. Hutter, Elsiver Ltd, 2007, 473p.
34.	Intelligent Textiles and Clothing by H.R. Mattila, Wood head Publishing Ltd, 2006, 506p.
35.	Joint Replacement Technology by A. Revell, Woodhead Publishing Ltd, 2008, 675p.
36.	Applications of Nonwoven in Technical Textiles by R.A. Chapman, Woodhead Publishing Ltd, 2010, 212p.
37.	Technical Textiles Yarns Industrial and Medical Application by R. Allagirusamy and A. Dass, Woodhead Publishing Ltd, 2010, 612p.
38.	Medical and Health Care Textiles by S.C. Anand et al., Woodhead Publishing Ltd, 2010, 529p.
39.	Compression Garments for Enhanced Performance, Textile Intelligence Ltd., UK. 2008 IV, 16p.
40.	Industry Technology Roadmapping of Nonwoven Medical Textiles by Asad Amir North Carolina State University, USA. 2006. 133p.
41	Ayurvedic healing. By David Frawly
42	Textbook of medical physiology. By Guyton and Hall
43	Ganong's review of medical physiology. By Kim Barret
44	Essentials of human anatomy and physiology. By Elaine Marieb
45	Fundamentals of Biochemistry. By Jain
46	Essentials of Biochemistry. By Satyanarayana
47	Biochemistry. By Satyanarayana
48	Elements of Biotechnology. By Dubey
49	Elements of Biotechnology. By Gupta
50	Anatomy of Physiology in Health and Illness. By waugh
51	Principles and Techniques of Biochemistry and Molecular Biology. By Wilson
52	Biomaterials for artificial organs. By Webster
53	International Nonwovens Symposium 2009. by EDANA
54	International Nonwovens Symposium 2007. by EDANA
55	International Nonwovens Symposium 2006. By EDANA
56	Outlook 2009. by EDANA
57	Nonwovens Research Academy 2008. by EDANA
58	Nonwovens Research Academy 2007. by EDANA
59	Nonwovens Research Academy 2006. by EDANA
60	Nonwovens Research Academy 2005. by EDANA
61	Standard Test Methods for the Nonwovens Industry–Edition2011.by EDANA
62	Worldwide Outlook for the Nonwovens Industry 2007-2012. by EDANA
63	World Markets for Technical Textiles to 2017.

List of Journals

1.Medical Textiles Published by International News Letter, U.K.
2.Future Material
3.Asian Technical Textiles
4.Technical Textiles International
5.BCH Tech Tex India
6.Nanotech Insight
7.Nano Vision
8.Nonwoven & Technical Textiles Technical Textile International

List of Standards

1	ASTM Volume 11.03	Standards of Medical/Protective Textiles.
2	ISO 10993-15	
3	AS 3789 10	Australian Standards
4	ASTM E 2180 – 07	Activity of incorporated antimicrobials agents in polymeric or hydrophobic materials
5	ASTM E 1881 – 06	Standards guides for cell culture analysis with SIMS
6	ASTM F 0813 - 07	Standards practice for direct contact cell culture evaluation of materials for medical devices
7	JIS L 1902:2008	Testing for antibacterial activity and efficacy on textile products
8	BS EN 13726-1:2002	Test methods for primary wound dressings – Aspects of absorbency
9	BS EN 13726-2:2002	Test methods for primary wound dressings – Moisture vapour transmission rate of permeable film dressings
10	BS EN 13726-3:2003	Test methods for primary wound dressings – Waterproofness
11	BS EN 13726-4:2003	Test methods for primary wound dressings – Conformability
12	BS EN 13726-6:2003	Test methods for primary wound dressings – Odour control
13	BSEN 13795:2011	Surgical drapes, gowns and clean air suits, used as medical devices for patients, clinical staff and equipment general requirements for manufacturers, processors and products, test methods, performance requirements and performance levels
14	BSEN 14683:2005	Surgical masks requirements and test methods
15	ISO 811:1981	Textile fabrics – Determination of resistance to water penetration – Hydrostatic pressure test
16	AS 3789.1-1991	Textiles for health care facilities and institutions: Part 1 General ward linen.
17	AS 3789.2-1991	Textiles for health care facilities and institutions: Part 2 Theatre linen and pre-packs.
18	AS 3789.4 – 1994	Textiles for health care facilities and institutions: Part 4 Wool blankets.
19	AS 3789.5 – 1996	Textiles for health care facilities and institutions: Part 5 Wool blankets – laundering procedures.
20	AS 3789.6 – 1998	Textiles for health care facilities and institutions: Part 6 Fabric specifications.
21	AS 3789.8 – 1997	Textiles for health care facilities and institutions: Part 8 Recyclable barrier fabrics.
22	AS 3789.9 – 1998	Textiles for health care facilities and institutions: Part 9 Curtains and patient bed screens – Fabric performance properties.
23	AS3789.10 – 2000	Textiles for health care facilities and institutions: Part 10 Blankets – cotton woven cellular blankets.
24	ISO 9073	Textiles – test methods for nonwovens. (15 Standards)
25	ISO 10993	Biological evaluation of medical devices. (7 Standards)

Technical Manpower

S.No	Name	QualificationExperience	(Years)
1	Dr.Prakash Vasudevan (Director)	Ph.D	21
2	Sakthivel Perumalsamy (Head)	MBA D.H.T	25
3	Dr . K.P. Chellamani.	Phd	32
4	R.Krishnan	M.E	30
5	Dr.Santhini	PhD (Biotechnology)	1
6	S.Thirupathi	M.Tech (Textile Technology)	19
7	V.Kumaravel	B.E (Mechanical Engineering)	26
8	S.Sounderraj	M.Tech (Textile Technology)	14
9	T.Sureshram	M.Tech (Textile Technology)	8
10	P.Sundramoorthy	M.Tech (Textile Technology)	2
11	Dr. Thirumala srinivas P	B.A.M.S, M.F.M NIFT	2
12	S.P.Sivasubramanian	M.Tech (Technical Textiles)	2
13	A.Neha	M.Tech (Technical Textiles)	-
14	V.J.Rajendren	D.T.T	32
15	D.Ranganathan	M.Sc (Chem)	16
16	C.Sathishkumar	M.Sc (Chem)	6
17	B.Renuka	M.Sc (Chem)	5
18	K.Nandhini	M.Sc M.Phil (Microbiology)	1
19	S.Ravichandran	D.T.P	3

List of Standards Formulated

SITRA has formulated the standards for the following Meditech related products:

1. Disposable surgical gowns
2. Disposable surgical drape
3. Disposable surgical face mask
4. Cellulose wadding
5. Vapor permeable water proof plastic wound dressings
6. Non-woven gauze bandage
7. Paraffin gauze dressings
8. Knitted viscose primary dressings
9. Perforated film absorbent dressings
10. Tubular bandages
11. Orthopedic stockings

List of Manuals Prepared

The COE on Meditech has produced manuals covering a vast array of subjects relevant to the field of Medical textiles.

1. The scope of medical textiles in India
2. Basic quality requirements for meditech products
3. Nonwovens: Technology & Machinery
4. Training workshop on medical textiles with special emphasis on products & devices for bandaging and pressure garments
5. Meditech products produced using existing machinery setup
6. Functional finishes for medical textiles
7. Textile composites for technical textiles
8. Production and application of wound care products for chronic and acute wound
9. Manufacturing of Meditech products using advanced technique
10. Opportunities and challenges for fibrous products in medical and hygiene sector

R&D Projects on Technical Textiles Undertaken/Under Progress

	R & D Project Title	Status of the Projects
1	Development of bifurcated vascular graft	Completed
2	Design and development of hernia mesh	Completed
3	Development of barbed, bi-directional surgical sutures	Completed
4	Development of functional spacer fabrics for medical inlays in orthopedic shoes	Completed
4	Development of specialty 3 D compression bandages for lymphedema	Completed
5	Development of spunlaced non-woven wound dressings using bamboo fibres	Completed
6	Breathability of woven surgical gowns treated with nano finishes	Completed
7	Design and fabrication of an instrument to assess the barrier properties of operation theatre surgical apparels with specific reference to blood and other body fluids	Completed
8	Development of special wound care dressing made of PVA / Chitosan and PVA/Silver nitrate nano membrane	Completed
9	Development of compression bandage pressure measurement systems	Completed
10	Controlled drug release on Chitosan-coated cotton gauze	Completed
11	Development of rotator cuff repair devices for shoulder re-construction	Completed
12	Development of wound dressing made of electro spun herbal drug and allopathic drug incorporated in PCL nano membrane	Ongoing
13	Hospital bed linens with enhanced thermal properties for coma patients	Ongoing

	R & D Project Title	Status of the Projects
14	Design and fabrication of an instrument to assess the resistance of materials used in medical face masks to penetration against aerosol particles using latex spheres	Ongoing
15	Development of textile matrices for the effective wound management	Ongoing
16	Development of a 'Hi-protection' nanomembrane incorporated & Nano-coated Surgical facemask	Ongoing
17	Design and Development of an automated equipment to produce knotless incision closures,	Ongoing
18	Development of a Leukodepletion Blood Filter	Ongoing

Training Programmes Offered

Following are the list of training programmes offered by the Meditech COE at SITRA:

1. The scope of Medical textiles in India
2. Basic quality requirements for Meditech Products
3. Nonwovens: Technology & Machinery
4. Training workshop on Medical textiles with special emphasis on products & devices for bandaging and pressure garments
5. Meditech products produced using existing machinery setup
6. Functional finishes for Medical textiles
7. Textile composites for technical textiles
8. Production and application of wound care products for chronic and acute wound
9. Manufacturing of Meditech products using advanced technique
10. Opportunities and challenges for fibrous products in Medical and hygiene sector

Programs Conducted

- Diversification possibilities in Meditech held at Thiruchengode on 09.02.2012
- Diversification possibilities in Meditech held at Bhavani on 23.02.2012
- Diversification possibilities in Meditech held at Thirupur on 09.03.2012
- One day all India medical textiles stakeholders meet at SITRA on 24.03.21012
- Workshop on Medical compression stocking production using Merz machine – Germany 25.04.2012 to 27.04.2012 at SITRA
- One – day Workshop titled "Business Opportunities in Medical Textiles" was conducted at Palladam Hi-tech Weaving Park on 21.07.2012
- One day training programme entitled on " Business opportunities in technical textiles at Karnataka" was conducted at Bangalore on 14.09.2012
  One day training programme entitled on " Business opportunities in Meical Textiles" was conducted at Karur on 29.11.2012

Foreign Collaboration Details

SITRA has executed a MoU on 25th January, 2010 with the University of Bolton, UK. The MoU is valid for 2 years and it has been renewed for another 2 years, and covers research in healthcare and medical textiles.

Details of Prototypes Developed

The following prototypes have been developed by SITRA:

1. Woven surgical gowns treated with nano finishes
2. Hernia mesh
3. Heart valve fabric
4. Functional spacer fabrics for medical inlays in orthopaedic shoes
5. Woven arterial prosthetic graft
6. Clinical heart patch
7. Bandages using bamboo fibres
8. Ankle support
9. Development of 4- layered face mask
10. Development of 8-layered mopping pad

Woven surgical gowns treated with Nano finishes

Woven surgical gowns treated with Nano finishes

Hernia mesh

Heart valve fabric

Orthopaedic shoes

Woven arterial prosthetic graft

Clinical heart patch

Bandages using bamboo fibres

Ankle support

Type of Technical Consultancy Provided/Offered

	Client Name and Address	Manufacturing Items	Services Offered by SITRA
1.	KOB Medical Textiles, Perumpalli, Semmipalayam Village, Trichy Road, Palladam-641 662. Phone: (04255) 277833 Fax No.(04255) 277836 E-mail: nvi@kobmt.com	Medical Bandages	Waste generation analysis and reduction and fixation of norms for waste for various types of bandages

	Client Name and Address	Manufacturing Items	Services Offered by SITRA
2.	Dynamic Techno Medicals Pvt. Ltd., Post Box No.45, Asokapuram, Aluva, Kerala-683 101. Phone: (0484) 2837788, 2837970 Fax No .(0484) 2837688 E-mail: dynamicortho@sify.com	Medical Stockings, Bandages, etc.	Consultancy offered for product development in bandages
3	Sidd Life Sciences P. Ltd., Plot No.4, NH-7, M.M.DA Industrial Estate, Maraimalai Nagar-603 209. Tamil Nadu	Membrane Oxygenator	Development of fabric winding machine for membrane oxygenator
4.	T.T.K. Healthcare Ltd., Plot A-28, Kinfra Apparel Park, St. Xavier's College Post, Thumba, Trivandrum-695 586. Fax : (0471) 2707004 E-mail: heartvalve@ttkhealthcare.com	Vascular Grafts, Heart Valve, etc.	1) Development of clinical heart patch fabric 2) Development of heart valve fabric 3) Development of Prosthetic vascular grafts
5.	Eucare Pharmaceuticals Private Limited, Plot No.AC-25B, Sidco Industrial Estate, Thirumudivakkam, Chennai-600 044. md_eucare@yahoo.co.in Fax No.(44) 2478 2516 E-mail: eucare@vsnl.com	Development of Oxidised Cellulosic Fabrics for Haemostatic Purpose	1) Development of Haemostatic fabric using cotton and rayon 2) Development of nylon 66 fabric for medical application
6.	Comfort Meditex (I) Pvt. Ltd., 2/949-B, Rupika Garden, Mahalakshmi Nagar (East), Goundampalayam Road, Palladam 641 664, Tirupur District. Phone 04255 251846, 256097 Fax 04255 256098	Bandages, Crepe Bandages, Elastic Bandages, Compression Bandages etc. for Medical Application	Testing, product analysis and re-engineering of bandages for medical

Other services and support offered by Meditech COE at SITRA

A range of services and support programmes are provided, an illustrative list is presented below:

- Inter-Mill Study of Productivity
- Managerial Training Programmes
- Quality Audit
- Energy Audit
- Maintenance Audit
- Functional Programmes
- Quality Management
- Apparel Costing
- Calibration Services
- Software Development
- Training Programmes for Shop Floor Workers
- Effluent Characteristic Study and Advice on the Treatment Plants

Contact Details

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6.COE on Protech

Lead: Northern India Textile Research Association (NITRA)

Background and Information of Parent Organization(s)

The Centre of Excellence for Protective Textiles is led by NITRA. The first phase of the COE implementation also saw involvement from the Indian Institute of Technology, New Delhi.

Northern India Textile Research Association (NITRA)

NITRA is one of the four textile research associations established in the year 1974 with the objective to carry out scientific research in the field of textiles as well as to promote and foster scientific research studies for the extension of knowledge related to or connected with textile industry. NITRA is linked to the Ministry of Textiles and recognized by the Department of scientific and Industrial Research for providing services to centralized as well as decentralized sectors.

NITRA is rendering services to centralized sector through various R&D projects, consultancies, training programmes and publications. These services span across areas such as energy audit, manpower studies, pollution control, machine and design development, designing of effluent treatment plants and software development. Besides, NITRA helps the industry in solving their operational problems. NITRA is also rendering services to the decentralized sector through seven Powerloom Service Centers established by the Ministry of Textiles, Govt. of India in the Northern Region under administrative control of NITRA, Ghaziabad.

Indian Institute of Technology (IIT), Delhi

IIT Delhi was created as centre of excellence for higher training, research and development in science, engineering and technology in India. Established as college of Engineering in 1961, the Institute was later declared an institution of National Importance under the 'Institutes of Technology (Amendment) Act, 1963' and was renamed 'Indian Institute of Technology Delhi'.

The Textile Technology Department at IIT Delhi enjoys a special status in the country and has the distinction of being the only Textile Technology Department among the IITs. The Department aims to achieve excellence in education in Textile Technology through continuous up gradation of textile syllabi, conducting fundamental research in established and emerging technologies as well as applied/developmental research by closely interacting with the industry and thus provides highly competent technical manpower to the industry, R&D organisations and academic institutes.

Infrastructure Facilities

Testing Instruments Installed at NITRA

	Equipment	Purpose
1	Flammability tester (Surface & edge ignition)	This instrument is useful to test work wear as per national and International standards.
2	Limited Oxygen Index Tester	This instrument is used to test flame retardant behavior of fabric under varying oxygen and nitrogen concentrations
3	Contact Heat Tester	This instrument is used to test the protective textile material against contact heat.
4	Washing and dry cleaning cylinder	This instrument is used to determine the effect of washing and dry cleaning on flame resistance properties of protective clothing.

	Equipment	Purpose
5	Moisture analyzer	This instrument is used to determine moisture content in the protective textiles.
6	Mechanical pre-treatment device for metalized material	The effectiveness of metalized coatings in reflecting radiant heat can be drastically reduced by the effect of wear. In this instrument protective textiles are mechanical pretreated to simulate wear.
7	Rapid oil extraction apparatus	This instrument is used to determine quantity of spin finish oil in the textile materials.
8	Bundesmann Water repellency Tester	This instrument is used to determine the resistance to the passage of simulated rain by fabrics being rubbed and rotated.
9	Rotary crock meter	This is used to determine wet or dry rubbing fastness properties of printed fabric.
10	Humidity and temperature control Chamber	This is used to condition textile material before performing tests.
11	Inclined Automatic Flammability Tester	To determine the burning characteristics of textiles under controlled conditions, when the textile material is in inclined (45o) stage.
12	Molten metal splash Tester	This instrument is used to assess the resistance of protective clothing to molten metal splash.
13	Vertical Flammability Tester	This instrument is used to measure the vertical flame spread for children sleepwear, fabrics and other textile materials.
14	Horizontal Flammability Tester	To determine the comparative burn rates and burn resistance of textiles.
15	Radiant Heat transmission tester	This instrument is used to compare the heat transmission on exposure of radiant heat through materials used in protective clothing. By this instrument heat transmission index is measured
16	Convective heat Tester	This instrument is used to compare the heat transmission on exposure of flame through materials used in protective clothing. By this instrument heat transmission index is measured.
17	Moisture Management Tester	This instrument is used to measure liquid moisture management properties of knitted, woven and nonwoven textile fabrics.
18	Fogging Tester	This instrument is used to determine fogging characteristics of automotive interior trim of textiles, plastic or leather.
19	Hydrostatic Head Tester	This is used to determine the resistance of fabric to water penetration under pressure while firmly clamped in the test rig of standard area, by means of dynamic test method and static test method.
20	Spray Tester-Water Repellency	To determine the surface wetting resistance of fabric.
21	Water Cooled Xenon Tester	This instrument is used to determine weathering effect on textile and plastic material.
22	High Visibility clothing testing equipment	These instruments are used to determine the high visibility clothing (Retro reflective and background material).
23	Electronic crock meter	This is used to determine the colour fastness of textile materials to dry or wet rubbing.
24	Vibroscope & Vibrodyne (Lenzing)	Vibroscope : To determine fineness of manufactured fibres Vibrodyne : To determine fibre tensile properties viz breaking strength , tenacity , Elongation , Modulus etc.

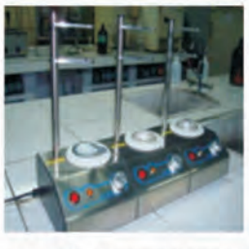
	Equipment	Purpose
25	Vibrotex (Lenzing)	To determine crimp stability of manufactured fibres
26	Microscope & Microtome (Zeiss)	For microscopic studies
27	Uster Tester-5	To determine yarn unevenness , imperfections & hairiness
28	Uster Tensorapid -4	For tensile properties of yarn / Thread viz breaking force , tenacity , elongation , modulus etc
29	Constant Tension Transport (CTT) Lawson- Hemphill	To determine frictional properties of yarn
30	Universal Tensile Testing M/C (SDL)	To determine tensile properties of yarn / Fabric and also used for seam strength , puncture strength , Peel / bond strength , constant load elongation and Tear strength etc
31	Martindale Abrasion Cum Pilling tester (SDL)	To determine abrasion & Pilling properties of fabric / garments
32	CSI Abrasion Tester	To determine wear properties of fabric and garment
33	Wyzenbeek Abrasion tester (Oscillatory abrasion Tester) SDL-ATLAS	To determine abrasion Resistance property of textiles
34	ICI Mace Snag Tester SDL-ATLAS	To determine snagging resistance property of fabric /garments
35	Tear strength Tester (Textest)	To determine tear strength of fabric / Garments (Elmendorf Tear)
36	Surface Resistance Tester (Rothschild static Voltmeter)	To determine antistatic properties of textiles
37	Brush Pilling Tester (SDL-ATLAS)	To determine fuzz & Pilling Propensity of textiles .
38	Air Permeability Tester (WIRA)	To determine air permeability of fabric / Garments
39	Toxicity Tester	To determine toxicity of various materials.
40	D.S.C. Instrument	To determine thermal properties of polymers.
41	T.G.A. Instrument	To determine thermal properties of polymers.
42	Universal Tensile Machine	To determine tensile properties of materials.
43	Seam Fatigue Tester	To determine the effect of cycles on seam.
44	Resistance to Heat under Load Tester for Zipper	To determine the effect of heat and load on zippers.
45	Reciprocating Movement of Slider under Load Tester for Zippers	To determine the effect of zippers movement under load.
46	Endurance Test for Hook & Loop Fastener	To determine the usability of hook & loop fastener.
47	Deterioration of Smoke Visibility Tester	To determine the effect of smoke generated on visibility.
48	Vertical flammability tester (as per NFPA- 701, Method-2)	This instrument is used to evaluate the burning behaviour of coated, laminated, multilayered fabric, films and plastic blinds having mass more than 700 g/sq meter.
49	Salt spray chamber	This apparatus is to be used in conducting the neutral salt spray, acetic acid salt spray and copper-accelerated acetic acid salt spray tests for assessment of the corrosion resistance of metallic materials, with or without permanent or temporary corrosion protection especially automotive industry.
50	Electrical resistance tester	This instrument is used to determine electrical resistance of the protective material

	Equipment	Purpose
51	Impact of spatter tester	This instrument is used to evaluate the behaviour of protective clothing on impact of small splashes of molten metal
52	Accelerated weathering tester	This instrument is used to determine weather resistance of a material
53	Gas fume chamber	This instrument is used for assessing the resistance of the color of textiles of all kinds and in all forms when exposed to atmospheric oxides of nitrogen as derived from the combustion of natural gas
54	Thermal & water vapour resistance tester	This instrument is useful to determine thermal and water vapour resistance of protective textiles.
55	IMO tester (as per International maritime organization)	This instrument is used to determine Lateral spread of flame on building and transport products in vertical configuration
56	Thermal protection performance tester (TPP)	It measures the thermal performance properties of textile materials when exposed to a dual open burner heat source combined with quartz heater radiant exposure
57	Digital printing machine	This machine is used in continuous printing of fabrics and garments.
58	Jigger	This machine is used for chemical processing the material in open width.
59	Tumble Pilling Resistance Tester	To assess pilling tendency of the fabric
60	Blade cut resistance Tester	To determine Blade cut resistance property of the fabric
61	Thermal Shrinkage Tester	To determine thermal shrinkage of yarn / plastics tapes
62	Schopper Abrasion Tester	To determine abrasion resistance of fabric
63	Yarn on Yarn abrasion	To determine abrasive property of yarn/ thread
64	Fabric Friction Tester	To determine static & kinetic friction of the fabric
65	Toxic Index Analysis Chamber	To determine toxic index of materials
66	Temperature Chamber for UTM	To determine tensile properties at different temperatures
67	Deep Freezer	To study affect of low temperature on protective textiles
68	Crumple Resistance Tester	To determine crumple resistance of protective and automotive fabrics

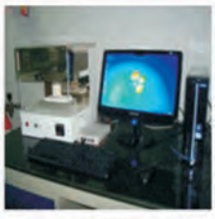
Testing Equipment Installed at IIT, Delhi

1. Sweating Guarded Hot Plate
2. Dynamic Impact Tester
3. Ball Burst Tester
4. Low Stress Property Kawabata KES Auto System
5. High Visibility Clothing Testing Equipment
6. Thermolab -Thermal Property Measuring Instrument
7. Liquid Barrier Test System
8. Dynamic Fatigue Tester
9. Hirox Advanced 3 D Video Microscope
10. Moisture Balance
11. Temperature Chamber for Ball Burst Tester
12. Gravimetric Absorption Test System (GATS)
13. Gas/Vapor Permeameter

Images: Testing Equipment at the COE

 Electronic Crock Meter	 High Visibility Clothing Testing Equipment	 High Visibility Clothing Testing Equipment
 Water Cooled Xenon Tester	 Spray Tester-Water Repellency	 Hydrostatic Head Tester
 Fogging Tester	 Moisture Management Tester	 Convective Heat Tester
 Radiant Heat Transmission Tester	 Horizontal Flammability Tester	 Vertical Flammability Tester
 Molten Metal Splash Tester	 Inclined Automatic Flammability Tester	 Humidity And Temperature Control Chamber
 Rotary Crock Meter	 Bundesmann Water Repellency Tester	 Rapid Oil Extraction Apparatus

Images: Testing Equipment at the COE

 Mechanical Pre-treatment Device For Metalized Material	 Moisture Analyzer	 Washing And Dry Cleaning Cylinder
 Water Cooled Xenon Tester	 Limited Oxygen Index Tester	 Flammability Tester For Vertical Oriented Samples
 Vibroscope & Vibrodyne (Lenzing)	 Vibrotex (Lenzing)	 Microscope (Zeiss)
 Uster Tester-5	 Constant Tension Transport (CTT) Lawson- Hemphill	 Universal Tensile Testing M/c (SDL)
 Martindale Abrasion Cum Pilling Tester (SDL)	 CSI Abrasion Tester	 Wyzenbeek Abrasion Tester (Oscillatory Abrasion Tester) SDL-ATLAS
 ICI Mace Snag Tester SDL-ATLAS	 Tear Strength Tester (Textest)	 Surface Resistance Tester (Rothschild Static Voltmeter)

Images: Testing Equipment at the COE


Brush Pilling Tester (SDL-ATLAS)


Air Permeability Tester (WIRA)


Toxicity Tester

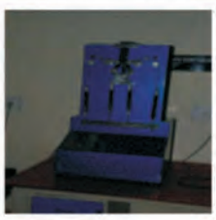

D.S.C. Instrument


T.G.A. Instrument


Universal Tensile Machine


Seam Fatigue Tester

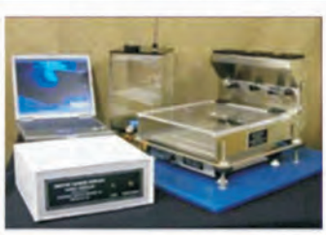

Resistance to Heat under Load Tester for Zipper


Reciprocating Movement of Slider under Load Tester for Zippers


Endurance Test for Hook & Loop Fastener


Microtome (Zeiss)


Deterioration of Smoke Visibility Tester


Sweating Guarded Hotplate


Ball Burst Tester


IMO Tester

Parameters that can be tested at the Protech COE*

Heat and Flame Resistance Tests

Personal Protective Clothing	
Ease of ignition of vertically oriented specimen	BS EN ISO 6940
Flame spread properties of vertically oriented specimen	BS EN ISO 6941, BS EN 1103
Night wear clothing	BS 5438, BS 5722

*For test charges and other details, visit **www.nitratextile.org**

45° inclined specimen	16FR 1610, ASTM D 1230, NFPA 702
Vertical flammability test	IS:11871, BS 3119, NFPA 1971
Horizontal flammability test	IS:15061, ASTM D 4804
Limited flame spread test	ISO 15025, BS 5438:1976 test 1, test 2 and test 3, IS:15758 (part-4)
Surface flammability test	ISO 5658-2, IMO A 653
Convective heat test	ISO 9151, IS:15758 (part-1)
Radiant heat test	ISO 6942, IS:15758 (part-2)
Molten metal splash test	ISO 9185, IS:15758 (part-5)
Contact heat test	ISO 12127
Thermal Protective Performance Tester (TPP)	NFPA-2112, ISO 17492, NFPA 1971, NFPA 1981, ASTM F 2700, ASTM 2703
Thermal & water vapour resistance tester	ISO 11092
Impact of spatter test	ISO 9150, IS:15758 (part-1)
Electrical resistance	EN 1149-2
High visibility	EN 471, IS:15809

Upholsteries

Ignitability of vertically oriented specimen	BS EN 1101, IS:15612, IS:15741
Flame spread vertically	BS EN 1102, NFPA 701, BS 5867, BS EN 13772
Smoldering cigarette test	IS: 15727, BS 5852 (Source 0)
Match flame, cribs	BS 5852 (Source 1 to 7)

Automotive Fabrics

Horizontal test	FMVSS 302, DIN 75200, IS 15061

Fabric Supplies to Railways

Limiting oxygen index	IS:13501, ISO 4589-2
Smoke visibility test	UIC 564-20R appendix 15
Toxicity Index	NCD 1409
Fire resistance test	UIC 564 OR

Floor Coverings

Methanamine tablet test	BS 6307, IS: 12722
Hot metal nut test	BS 4790
Vertically oriented	IS: 15764

Colour fastness and weathering effect

Colour fastness to light	IS 2454, ISO 105 B02, B 03, B04, AATCC-16
Colour fastness to laundering	IS 105-C10, C06, AATCC 61
Colour fastness to Rubbing	IS 766, ISO 105-X12, AATCC-8
Colour fastness to Perspiration	IS 971, ISO 105 E04, AATCC 15

Water resistance

Bundesmann/shower test	IS 392

Cone Test	IS 7941
Spray Test	IS 390, AATCC 22, ISO 4920
Hydrostatic pressure Head Test	IS 7016 (Part-VII), AATCC 79, ASTM D 4772
Water vapour transmission test	ASTM E 96

Mechanical Testing on fabric / Garments

Tensile Strength	IS :1969
-Cut Strip Method	ASTM D 5034
-Wide width Method	ASTM D 5035
-Ravelled Strip Method	ASTM D 4355
-Grab Method	ASTM D 4595
	ISO 5081
	ISO 10319
Tear strength	IS : 6489
-Falling Pendulum Method	ASTM D 1424
-Single Tongue Tear	ASTM D 2261
-Double Tongue Tear	ASTM D 4533
-Trapezoidal Tear Method	ASTM D 5587
	ISO 9290
Bursting Strength	IS: 1966
-Ball Bursting Method	ASTM D 3787
-Diaphragm Bursting Method	ASTM D 3786
Abrasion Resistance	IS : 12673
-Martindale Abrasion	ASTM D 3885
-Flax & Flat Abrasion	ASTM D3886
-Wyzenbeek Abrasion	ASTM D 4966
	ASTM D 4157
Schopper Abrasion Test	DIN 53863 Part – 2
	GMW 3283, GME 60345
Puncture Strength Test	ASTM D 4833
-Falling cone Method	ASTM D 6261
-CBR Puncture Method	ASTM D 6241
Seam strength Test & Seam Slippage Test	ASTM D 1683
	ASTM D 434
	ISO 13935-1 &2
	ISO 13936 -1&2
Snag Resistance Test	ASTM D 3939
Fabric Stretch & Growth	ASTM D 6614
	ASTM D 5278
	ASTM D 3107;2594
Stiffness & Flexural Rigidity	IS 6490
	ASTM D 1388
	BS 3356
Constant Load Elongation & permanent set	ASTM D 6614

Bond / Adhesion strength / Peel Strength / Shear strength	ASTM D 2724 ASTM D 3936 ASTM D 3135
Cut resistance	ISO 4637 EN 388

Mechanical Testing on Yarn / Thread

Yarn / Thread Strength Loop strength & Knot strength	ASTM D 2256 IS :1671
Yarn / Thread Elongation	ASTM D 2256 IS :1671
Yarn Un-evenness & Imperfections	ASTM D 1425 ISO 16549
Yarn Twist	ASTM D 1422/1423 IS 832
Yarn / Thread Shrinkage due to exposure to boiling water or dry heat	ASTM D 204 ASTM D 4974 ASTM D 2259
Thread Diameter	ASTM D 204
Yarn on yarn abrasion (Dry & Wet)	ASTM D 6611
Yarn to Yarn & Yarn to metal friction	ASTM D 3108 ASTM D 3412

Mechanical Tests on Fibre Properties

Microscopic study on fibre structure -Longitudinal / Cross sectional structure	
Fibre length	ASTM D 5103 IS 10014 Part 1
Fibre Fineness	ASTM D 1577 IS 10014 Part 2 BISFA
Fibre Strength , Elongation and Modulus	ASTM D 3822 ISO 5079 DIN 53816
Fibre Crimp & crimp stability	ASTM D 3937
Fibre Shrinkage -Bundle Test -Single Fibre Test	ASTM D 2102-07 ASTM D 5104
Fibre Diameter Breaking Tenacity of manufactured fibres in loop & knot configuration	- ASTM D 3217

Additional tests

Zipper Test	IS 14181, IS 3148, IS 9748 and BS 3084
Endurance Test for Hook & Loop Fastener	IS 8156
Seam Fatigue Test	JASO M 403, HES D 6511, SES N 3298 & 3294 and NES M 7081
D.S.C. & T.G.A.	ASTM D 3418 and ASTM D 6370

Crease Flex Test	HES D 6511 and SES N 3298
Tensile Properties	IS 7016, IS 1969, ASTM D 638
Thermal Insulation	Thermal Conductivity Apparatus
Ultra Violet Protection factor	AATCC 183 and AS/NZS 4399
Peel Strength	IS 7016, IS 8156 and IS 1259
Ignitibility Test (includes Cigarette, Butane Gas, Wooden Crib Test)	BS 5852
Zipper(Slide Fastener)	-
Remeshability of Fastener	IS 14181
Fold Over Security of Textile Chain	IS 14181
Resistance to Abrasion under Load Cycles	IS 14181
Security of Attachment of Bottom Stop	IS 14181
Security of Attachment of Puller to Slider	IS 14181
Security of Attachment of Top Stop	IS 14181
Security of Inter-Locking of Textile Chain to Lateral Load	IS 14181
Security of Slider Lock Holding	IS 14181
Chain Crosswise Strength	IS 14181
Security of Attachment of Retainer to Longitudinal Load	IS 14181
Security of Attachment of Retainer to Lateral Load	I S 14181
Resistance to Heat under Load	IS 14181
Reciprocating Movement of Slider under Load	IS 14181

Incubation Center

The equipment that textile enterprises can leverage at the incubation centre for the Protech COE are indicated below:

Spinning Equipment

Blow Room	LR - 1993
Carding Machine	LR - 1981, C-1/2
Draw Frame	LR - 1981, DO-2S
Speed Frame	LR - 1981, GS
Ring Frame	LR - 1981, DJ - 5
Friction Spinning Machine	Fehrer - AG, 1998, DREF-III
Ginning Machine	Bajaj - 1994
Double Roller Gin	Mark - I
Two For One Twister (Trytex-2011)	Lab Model
Rotor Spinning Machine (Trytex-2011)	Lab Model
Parallel Winding Machine	Lab Model

Spinning Equipment at the COE"

Blow Room: LR – 1993

Carding Machine: LR - 1981 C-1/2

Ginning Machine Double Roller Gin: Bajaj – 1994 Mark - I

Draw Frame: LR – 1981 DO-2S

Speed Frame: LR – 1981 GS

Two For One Twister
(Trytex-2011): Lab Model

Ring Frame: LR – 1981 DJ – 5

Friction Spinning Machine:
Fehrer – AG, 1998 DREF-III

Rotor Spinning Machine
(Trytex-2011): Lab Model

Weaving Equipment

Rapier (Double) Weaving machine	Challenger
Automatic Loom	Ruti CA1NT
Terry Towel Loom	Cimmco
Sample Warping Machine	CCI
Sample Sizing Machine	CCI
Sample Loom	CCI
Hand Loom with Dobby	
Hand Loom with Jacquard	
Single Shuttle Leno Loom	Dashmesh
Double plush Loom	Dashmesh

Rapier (Double) Weaving Machine: Challenger

Automatic Loom: Ruti CA1NT

Terry Towel Loom: Cimmco

Sample Warping Machine: CCI

Sample Sizing Machine: CCI

Sample Loom: CCI

Hand Loom with Dobby

Hand Loom with Jacquard

Knitting Equipment

1. Interlock Knitting Machine
2. Knitability Tester
3. Flat Knitting Machine

Flat Knitting Machine

Knitability Tester

Interlock Knitting Machine

Additional Equipment At The Incubation Centre

	Equipment	Purpose
1.	Name: Single Needle 2-Thread Straight Lock Stitch Machine Make: Brother Model: SL 1010-3	The machine is used for all general application of joining and topstitching, mainly woven fabrics.
2.	Name: Button Hole Machine Make: Brother Model: HE-800A-2	The Button Hole Machine is used to create various types of Button Holes in various garments like Men's Shirts, T-shirts, and Ladies Tops etc.
3.	Name: Bartack Machine Make: Brother Model: KE-430D-02	The machine is used to reinforce certain areas of the garment which are subjected to excess stress due to repeated usage, such as pocket openings, bottom of fly opening, buttonholes etc.
4.	Name: Single Thread Chain stitch blind hem Machine Make: Brother Model: JC-9330-0	The machine is used to stitch bottom hems of Formal Trousers, Skirts etc.
5.	Name: Flatlock Machine Make: Brother Model: JC-9330-0	This machine is mainly used for knits. It is widely used for the applications like stitching undergarments both men and women, cover-stitching t-shirts.
6.	Name: Button Stitch Machine Make: Brother Model: BE-438D	The machine is used to attach various types of buttons to the garments like shirt, trousers, tops etc.
7.	Name: Fusing Machine Make: HASHIMA Model: HP-400CS	The machine is used to fix various types of interlinings to provide extra stiffness to the garments.
8.	Name: Single Needle Lockstitch Straight Buttonholing Machine Make: JUKI Model: LBH-781	The machine is capable of sewing heavy weight materials such as bulky knits with maximum lift of work clamp up to 12mm to make high quality button holes in Men's' Shirt, Blouses, Working wear, ladies wear etc.
9.	Name: 6 Thread Overlock Machine Make: JUKI Model: MO-6700	The machine makes safety stitch which is used in run stitching, gathering in knits and woven garments, swimsuit construction etc.
10.	Name: Twin Needle Feed of the Arm double chain	The machine is used in joining side seam, jeans inseam,

	Equipment	Purpose
	stitcher Make: Brother Model: DA-9270-A	balloon stitching etc.
11.	Name: 4 thread overlock machine Make: JUKI Model: MO-6700	It is used in seaming (over edging) knits and woven.
12.	Name: Single needle direct drive straight lock stitcher with thread trimmer Make: BROTHER Model: S-7200A-303	Used in all application of single needle lock stitching like run stitch/topstitch with ease of stitch length /pattern selection, automatic backtack, under bed thread trimmer etc.
13.	Name: High Speed single needle lockstitch machine with UBT Make: BROTHER Model: SL-737-403	Used in all application of single needle lock stitching like run stitch/topstitch with ease of stitch length /pattern selection, automatic backtack, under bed thread trimmer etc.
14.	Name: LECTRA CAD Plotter Make: LECTRA Model: ALYS-30	It is used to print marker, patterns etc. when connected with CAD Software
15.	Name: GERRBER Digitizer Make: GTCO Cacomp Model: SG63648	It is used to digitize paper patterns, which can be further used in CAD Software for pattern grading, marker making etc.
16.	Name: TUMBLE DRYER Make: RAMSONS	It is used to dry clothes after hydro extraction process in a heated rotating drum.
17.	Name: Textile Processing Machine Make: RAMSONS Model: RHTP-15	It is a type of tunnel washing with rotating basket where detergent mixed with hot water is sprayed for effective cleaning of clothes.
18.	Name: Hydro Extractor Make: RAMSONS Model: RDD	It is used to extract water with minimum energy requirement through centrifuge principle. The wet material is placed in the extractor, which has a wall of perforated metal, generally stainless steel. The internal drum rotates at high speed thus throwing out the water contained in it.
19.	Name: Stain buster (Stain Removing Work Station) Make: RAMSONS Model: CL-4	It is used to remove stains with the help of cold spotting guns & dual steam cum air gun. Body designed to stand all types of chemical spray makes it more effective for wide range of chemical applications.
20.	Name: Shirt Folding Table Make: RAMSONS Model: R-516	It is used to fold formal shirt with minimal time and effort.
21.	Name: Thread Sucking M/c Make: RAMSONS	It is used to suck loose threads, dust from a garment with the application of required air pressure.
22.	Name: Computerized Embroidery m/c with standard accessories Make: DEFU Model: DF1H9061500	It is a six head Computerized Embroidery m/c used to create embroidery design on fabric/garment with the help of a computer head in which required design floppy is loaded.

Images: Additional Equipment at Incubation Centre

Single Needle 2-Thread Straight Lock Stitch Machine

Button Hole Machine

Bartack Machine

Images: Additional Equipment at Incubation Centre

Single Thread

Flatlock Machine

Button Stitch Machine

Fusing Machine

Single Needle Lockstitch Straight Buttonholing Machine

6 Thread Overlock Machine

Twin Needle Feed of the Arm Double Chain Stitcher

4 Thread Overlock Machine

Button Stitch Machine

High Speed Single Needle Lockstitch Machine with UBT

LECTRA CAD Plotter

GERRBER Digitizer

Tumble Dryer

Textile Processing Machine

RDD

Stain Buster
(stain Removing Work Station)

Shirt Folding Table

Thread Sucking M/c

Computerized Embroidery m/c with Standard Accessories

Incubation Centre Activities

- Development of yarn for protective textile
- Development of knitted textile material for medical textiles
- Development of nettle/acrylic blended yarn and fabric

Details of Products Developed by COE

 Antimicrobial Baby T Shirt (Knitted, Cotton Crabyon 85/15, 30 Ne)	 Antimicrobial Baby T Shirt (Knitted, Cotton Crabyon 70/30, 30 Ne)	 Antimicrobial Baby T Shirt (Knitted, Cotton Silver Coated Nylon 95/05, 30 Ne)
 Antimicrobial Baby T Shirt (Knitted, Cotton Silver Coated Nylon 90/10, 30 Ne)	 Antimicrobial Polo T Shirt (Knitted, Cotton Crabyon 85/15, 30 Ne)	 Antimicrobial Polo T Shirt (Knitted, Cotton Crabyon 70/30, 30 Ne)
 Antimicrobial Polo T Shirt (Knitted, Cotton Silver coated Nylon 95/05, 30 Ne)	 Antimicrobial Polo T Shirt (Knitted, Cotton Silver coated Nylon 90/10, 30 Ne)	 Kidswear (Knitted, Cotton 100%, 30 Ne)
 Kidswear (Knitted, Modal Cotton 35/65, 30 Ne)	 Kidswear (Knitted, Modal 100%, 30 Ne)	 Kidswear (Knitted, Modal Cotton 50/50, 30 Ne)
 Man's Undergarment (100% Bamboo, 30 Ne)	 Lady's Undergarment (100% Bamboo, 40 Ne)	 Man's T Shirt (100% Bamboo, 30 Ne)

Lady's T Shirt
(100% Bamboo, 40 Ne)

Combat Uniform
(Nylon 66 Cotton, 50/50)

Stab Resistant Fabric from Dyneema
(Hi-Modulus Polyethylene) (HMPE)

Cut Resistant Fabric using Composite
Metallic Yarn

Cut resistant glove from Nylon/
Steel composite Metallic Yarn

Cut resistant glove from Polyester/
Steel composite Metallic

Cut resistant glove from Cotton/
Steel composite Metallic Yarn

Information Center

The books and data sources available at the Protech COE are listed below.

List of Books

S. No.	Book Title	Author	Publisher
1	Advanced Textiles for Wound Care	S Rajendaran	Woodhead Publications
2	Advances in Apparel Production	Catherine Fairhurst (Ed.)	WP
3.	Advances in Fire Retardant Materials	Horrocks, A R & D Price	Woodhead Publications
4	Advances in Textile Biotechnology	V Nierstrasz	Woodhead Publications
5	Advances in Yarn Spinning Technology	C A Lawrence	Woodhead Publications
6.	Applications of Nonwovens in Technical Textiles	R A Chapman	WP
7.	Basic Sewing	DK	D K
8.	Color Schemes	Lesley Taylor	New Holland
9	Colour Measurement : Principle advances and....	M L Gulrajani	Woodhead Publications
10.	Design and Manufacturing of Textile composites	Long, A C	Woodhead Publications
11.	Dry Cleaning Scouring Dyeing of Garments Furs & Rugs	William T. Brannt (Ed.)	Abhishek
12	Eco Textiles : The way of the forward	Mir Miraftab & A Horrocks, R (Ed.)	Woodhead Publications
13.	Engineering Textiles	Mohahse, Y Ee EI	Woodhead Publications
14	Fabric Testing	Jinlian, H U	Woodhead Publications
15	Fatique Failure of Textile Fibres	Mohsen Miraftab (Ed.)	WP
16	Fundamentals of Fire Fighter Skills	NFPA	NFPA
17	Global Market Review of Workwear : Forecasts to 2016	-	Online

18.	H B of Non Wovens	Russell S	Woodhead Publications
19.	H B of Technical Textiles	Horrocks A R	Woodhead Publications
20	H B of Tensile Properties of Textile and Technical Fibres	A R Bunsell	WP
21	H B of Textile Fibre Structure : Fundamentals and manufactured polymer fibres (Vol. 1)	S Eichhorn	Woodhead Publications
22	H B of Textile Fibre Structure : Natural, regenerated, inorganic and specialist fibres (Vol. 2)	S Eichhorn	Woodhead Publications
23	H B of Weaving	W S Murphy	Abhishek
24	HB of Worsted Wool and Blended Suiting Process	R S Tomar	WPI
25	High Speed Spinning Of Polyester and its Blends with Viscose	S Y Nanyal	WPI
26	Identification of Fibres	Houck, Max M (Ed.)	Woodhead Publications
27	Identification of Textile Fibres	Max M Houck (Ed.)	WP
28	Intelligent Textiles of Clothing	Mattila H R	Woodhead Publications
29	Interior Textiles : Design and development	T Rowe	Woodhead Publications
30	Management of Technology Systems in Garment Industry	Gordana Colovic	WPI
31	Medical & Healthcare Textiles	SC Anand	WP
32	Medical Textiles and Bio-Material for Health Care	Anand, S C, (Ed.)	Woodhead Publications
33	Military Textiles	Eugene Wilusz	Woodhead Publications
34	Modeling and Predicting Textile Behaviour	X Chen	Woodhead Publications
35	Modern Approach to Maintenance in Spinning	Neeraj Niijjaawan	WPI
36	Non Woven Textiles	Jirsak, O	Woodhead Publications
37	Personal Protection Textiles Report		Textile Media Services, UK
38	Personnel Protective Clothing : Ensuring workers safety	-	Online
39	Polymer Data Hand Book	Mark, James E (Ed.)	Oxford University Press
40	Protective Clothing	Pushpa Bajaj	Woodhead Publications
41	Sewing for Fashion Design	Nurie Relis	Printice Hall
42	Smart Textile Coatings and Laminates	W c Smith	Woodhead Publications
43	Smart Textiles for Medicine & Health Care	Longenhove, L Van (Ed.)	Woodhead Publications
44	Sustainable Textiles : Life cycle and environmental impact.	R S Blackburn	Woodhead Publications
45	Technical Textile Yarns : Industrial and medical applications	R Aligirusamy	WP
46	Textile Technology	Burkhard Wulfhorst	Hancer
47	Textiles for Cold Weather Apparel	J T Williams	Woodhead Publications
48	Textiles in Sport	Shishoo R	Woodhead Publications
49	Textiles, Polymers and Composites for Buildings	G Pohl	Woodhead Publications
50	Thermal and Moisture Transport in Fibrous Material	Pan, N and Gibson, P	Woodhead Publications
51	Tribology of Natural Fiber Polymer Composites	Navin Chand	WP
52	Ullman's Fibres (2 vol.)	-	Wiley-VCH Verlag
53	Wearable Electronics and Photonics	Tao, Xiaoming (Ed.)	Woodhead Publications
54	Smart Cloth and Wearable Technolog	McCann, J and Bryson, D (Ed.)	Woodhead Publications

List of Standards

S. No.	Book Title (No. of Copies)	Author	Publisher
1	AATCC Technical Manual – 2009	AATCC	AATCC
2	AATCC Technical Manual – 2011	AATCC	AATCC
3	ASTM SEC 11 (Vol.11.03) – 2007	ASTM	ASTM
4	ASTM SEC 4 (Vol.4.13)- 2008	ASTM	ASTM
5	ASTM SEC 7 (Vol.7.1 & 7.2)- 2008	ASTM	ASTM
6	ISO 12402 – 1 : 2005	ISO	ISO
7	ISO 12402 – 2 : 2006	ISO	ISO
8	ISO 12402 – 3 : 2006	ISO	ISO
9	ISO 12402 – 4 : 2006	ISO	ISO
10	ISO 12402 – 5 : 2006	ISO	ISO
11	ISO 12402 – 6 : 2006	ISO	ISO
12	ISO 12402 – 7 : 2006	ISO	ISO
13	ISO 12402 – 8 : 2006	ISO	ISO
14	ISO 12402 – 9 : 2006	ISO	ISO
15	ISO 12402 –10 : 2006	ISO	ISO

Technical Manpower

S. No.	Name of Employee	Qualification	Experience (Years)
1	Dr. J.V. Rao	B.Tech., M.Tech., Ph.D., FIV	42
2	Mr. Abhijit Pal	B.Sc. (Text. Tech), MS (by research), FIE, FIV	28
3	Dr. A.V. Agrawal	M.Text. (Text. Tech.),Ph.D., FIE, FIV	23
4	Dr. M.S. Parmar	M.Sc., Ph.D., PGDMM, DCPA	20
5	Dr. A.A. Ansari	M.Sc., M.Phil., Ph.D.	19
6	Dr. Surender Kumar	M.Sc., Ph.D.	27
7	Dr. B.K. Sharma	M.Sc., M.Tech., Ph.D., FIETE, SMCSI	21
8	Mr. A.K. Aggarwal	M.Sc.	35
9	Mr. A.K. Singh	B.Text. (Tech.)	33
10	Mr. Anil Kumar Pandey	B.Text. (Tech.)	33
11	Mr. Ankur Makhija	B.App.Sc. (Instrumentation), B.F.Tech. (Apparel Prodn.)	4
12	Mr. Avnish Kumar Sharma	M.Sc., Dip. in Op. Mgt., PGD in Comp. Progr., MCA	21
13	Mr. C.B. Chourasia	M. Tech.	22
14	Mr. K.K. Dewan	B.A., PGDBM, M.Sc.(Comp.Sc.). BHM, e-Commerce	13
15	Mr. M.K. Bansal	Dip. in Text. Tech., MBA	23
16	Mr. M.M. Tiwari	B.Sc., Dip. in Text.	31
17	Mr. Maheshwar Singh	B.Sc., Diploma in Tex. Chem.	29
18	Mr. Neeraj Aggarwal	B.Text., MS (by Research)	20
19	Mrs. Neha Kapil	M.Sc.	9
20	Mr. R.K. Gaur	B.Text., M.Tech. (IT), Dip. in Mgmt., Dip. in TQM&ISO 9000, Dip. in Prodn.Mgt., MIE	31
21	Mr. R.K. Sharma	B.Sc., ATA	29
22	Mr. R.S. Yadav	B.Tech. (Text.), MS (by Research), MIE	23
23	Mr. Rajiv Kumar	M.Tech. (Text. Tech.)	8
24	Mr. Sanjeev Shukla	B.Sc., B.Text., M.Tech., PGDBM	19
25	Mrs. Shweta Saxena	M.Sc.	9
26	Mr. U.C.Sharma	B.Sc., AMIE (Text.), MS (by Research), MIE, FIV	30
27	Mr. Vikas Sharma	B.E. (Mech.), Adv.Dip. in MM&CM	13
28	Mr. Vivek Agarwal	B.Tech., PGDBM, MS (by Research)	18

List of Standards Formulated

COE – Protech has reviewed/developed standards of technical textile items in Indian context. These are submitted to the Office of the Textile Commissioner, Government of India, Mumbai

Review of Draft specifications of BIS:

(i) Protective clothing for fire fighters
(ii) Textiles-Resistance to ignition of Mattresses, Diwans and Bed Bases

Specification developed by COE-Protech:

(iii) Nylon life jacket with expandable polyethylene foam, buckle and whistle plastics
(iv) Woven suiting made of cotton, man made fibres/filaments and their blends-IS 15853 : 2009
(v) Disruptive pattern (camouflage pattern) cloth for jungle operations made of nylon and cotton blended (NYCO) material
(vi) Unarmed combat dress
(vii) Anti mosquito veil

In addition, specifications for the following items have been specifically prepared for the Indian Navy, CRPF (CoBRA) and other armed forces:

Technical Specifications Prepared by Nitra for Indian Navy

<table>
<tr>
<td rowspan="2"> 
Unarmed Combat dress for Marine Commandoes</td>
<td> 
Cap FS Blue</td>
<td> 
T Shirt</td>
</tr>
<tr>
<td> 
Shorts</td>
<td> 
Socks</td>
</tr>
</table>

Technical Specifications Prepared by Nitra for CRPF (CoBRA)

<table>
<tr>
<td> 
NYCO Uniform</td>
<td> 
Life Jacket</td>
<td> 
Multi Purpose Light Weight Load Bearing Frame With Carrier Facilities and Convertibility As Stretcher</td>
</tr>
</table>

 Durable Combat Sack	 Water Proof Multipurpose Rain Poncho With Convertibility as Bivouac	 Pouches
 Anti-mosquito Veil	 Jungle Hat	 Balaclava with Convertible Properties as Cap Comforter, Face Mask and Cold Weather Muffler
 Tactical 3 Point Sling	 Special Operation Rope	 Nylon Belt

Technical Specifications Prepared for other Agencies

1. National Disaster Response Force, Ministry of Home Affairs: Development of colour specification of uniform
2. RPSF: Development of colour specification of uniform
3. DBEL: Development of test method of dope dyed material
4. CRPF: Specification of "Sleeping Bag"
   Specification of "Under Pant"
   Specification of "Towel Hand"
   Specification of "Cap Comfort Woolen"
   Specification of "P/V Dope Dyed"
5. Assam Rifles: Specification of "P/V Dope Dyed"
6. NSG: Specification of "P/V Dope Dyed"
7. Central Armed Police force: Specification of "P/V Dope Dyed"
8. Refrigeration House, Agra: Specification of colour code of "P/C 50:50"

Draft white paper on Formulation of Regulations in Respect of Safety Industrial Work-wear (Heat & Flame)

NITRA has prepared a draft white paper on Formulation of Regulations in Respect of Safety Industrial Work-wear (Heat & Flame). In order to provide safe working environment for workers engaged in high risk and hazardous environment, NITRA suggested amendments in 16 industrial acts. The paper is forwarded to Ministry of Textiles, GoI to implement the suggestions given in the paper by bringing it to the notice of concerned ministries for ensuring safe working conditions in the factories.

List of Manuals Prepared

Manual on manufacturing techniques, testing methods and procedures has been prepared on following:

- Manufacturing of fabrics using Hi-Modulus Polyethylene(HMPE) fibres

R&D Projects on Technical Textiles Undertaken/Under Progress

	R&D Project Title	Status
1	Development of fire resistant equipment	Completed
2	Development of industrial fabrics	Completed
3	Protective clothing from jute	Completed
4	Development of antimicrobial fabric	Completed
5	Development of UV resistant fabric	Completed
6	Protection against pesticides	Completed
7	Development of cut resistant & abrasion resistant protective textile by using composite metallic yarn	Completed
8	Developing shield of corn fabrics for enhancing the protection from flame	Completed
9	Developing armor using Hi-Modulus Polyethylene (HMPE) fibre	Completed
10	Development of water purification device using textile material for military and paramilitary personnel	Completed
11	Development of protective material from nylon 66 and corn	Completed
12	Development of flame resistant and chemical resistant laboratory coat/apron	Completed
13	Selection of combat uniform cloth on the basis of comfort, wear and safety properties	Completed
14	Development of special functional fabric for bedding and sportswear for providing extra-ordinary comfort with excellent micro climate	On-going
15	Development of an instrument to measure light and heat cutting properties of black out (coated Fabrics)	On-going

Following products have been developed at NITRA:

1 NYCO fabric for Paramilitary and Military combat uniforms
2 Personal protective textile using novel fibre
3 Functional fabric to provide bacterial & ultraviolet protection to the skin (bamboo)
4 Extra soft knitted fabric for inner wear / kids wear by using 'High Performance Modal Fibre'
5 Stab Resistant Fabric from Dyneema - Hi-Modulus Polyethylene (HMPE)
6 Cut Resistant Fabric using Composite Metallic Yarn
7 Cut resistant gloves from Nylon/Steel composite Metallic Yarn
8 Cut resistant gloves from polyester/Steel composite Metallic
9 Cut resistant gloves from Cotton/Steel composite Metallic Yarn

Training Programmes Offered

Supervisory Level Programs on Protective Textile

1. Heat resistant fabrics
2. Fire resistant fabrics
3. Fabrics for Extreme cold
4. Bullet Proof fabrics
5. Fabric for UV radiation protection
6. Fabric for Nuclear radiation protection
7. Fabric for Biological Protection
8. Fabric for Electromagnetic radiation protection
9. Fabric for Reduced Visibility Protection
10. Fabric for Chemical Protection
11. Cut resistant fabric
12. High-Visibility fabric

Programs For Laboratory Technician & Quality Controller

1. Testing & evaluation of Heat resistant fabrics
2. Testing & evaluation of Fire resistant fabrics
3. Testing & evaluation of Extreme cold fabrics
4. Testing & evaluation of Bullet Proof fabrics
5. Testing & evaluation of fabric for UV radiation protection
6. Testing & evaluation of fabric for Nuclear radiation protection
7. Testing & evaluation of fabric for Biological Protection
8. Testing & evaluation of fabric for Electromagnetic radiation protection
9. Testing & evaluation of fabric for Reduced Visibility Protection
10. Testing & evaluation of fabric for Chemical Protection
11. Testing & evaluation of Hi-Visibility fabric
12. Testing & evaluation of Cut resistant fabric
13. Tester-Fibre -length, Strength, elongation, fineness, crimp, etc.
14. Tester-Yarn Count, Strength, elongation, Twist, Evenness, etc.
15. Tester-Fabric structure, Strength, dimensions, abrasion, pilling, etc.
16. Tester-Blend Analysis

Operator Level Programs

1. Coating machine operator
2. Needle punching adhesive based non-woven machine operator
3. Sewing machine operator for heavy duty fabrics
4. Multilayer Industrial fabrics weaver
5. High speed knitting machine operator

Training Programs Conducted

1. Workshop on protective textiles at NITRA on 31.10.2009 with Textile Association of India (Delhi Unit)
2. Training programme on flame retardant textiles for M/s. Banswara Syntex at NITRA on 19.04.2010 to 24.04.2010
3. Training programme on quality evalution at NITRA on 14.06.2010 to 16.06.2010
4. Workshop on Aerospace textiles by 16 BRD Air Force on 29.10.2010
5. Seminar on "Protective Textiles" organized jointly by NITRA and M/s. Waxman Fibres at NITRA on 11.04.2011
6. Seminar on "Sewing Threads-Quality Requirements and Significance in Sports Goods Industry" organized jointly by NITRA and PPDC Meerut on 15.06.2011
7. Seminar on "An insight to industrial safety work wear" organized jointly by NITRA and Institutions of engineers at NITRA on 16.07.2011Workshop on "Personal protective fabrics for indian armed forces" to Ministry of Home Affairs on 04.10. 2011
8. Workshop on "Protective textiles-personal and aerospace" to Air Force,Palam on 11.10.2011
9. Training on protective textiles to M.Sc. students in 2011
10. Training on "Testing of textile materials for heat & flame resistance in workshop on Innovative methods in textile manufacturing and clothings" at TIT, Bhiwani on 11 & 12th February, 2012
11. Workshop on "Emerging opportunities in technical textiles in India" at Baddi on 24.03.2012
12. Seminar on Functional Textiles, 3 June 2012, organised by The Merchants' Chamber of Commerce & The Institution of Engineers, Kanpur
13. Seminar on technical textiles, 13 September 2012 in 15th India International Security Expo 2012, New Delhi
14. Workshop on safety & survival equipment, 18 October 2012 organised by Air Force New Delhi
15. Seminar on Vastra-2012, 23 November 2012,Jaipur

Foreign Collaboration Details

NITRA has entered into an agreement with University of Bolton, U.K. to conduct collaborative research in the area of Protective Textiles. The areas earmarked in the agreement are:

- Cooperate and exchange research findings for mutual benefits.
- Provide facilities for quality testing at respective institutions for research purpose.

- Support and engage in research dissemination activities such as journal publications and conference presentations in the areas of Protech.
- Support each other for staff deputation and training in the area of Protective Textiles.
- Deputation of experts and scientists for guidance in research work on mutually agreed terms.

NITRA has also entered into an agreement with Manchester Metropolitan University, UK to conduct R & D activities in the area of protective textiles.

NITRA has also entered into an agreement with M/s West Yorkshire Materials Testing Services, U.K for the provision of EC type certification and testing facility for protective textiles.

Details of Prototypes Developed

Following instruments have been developed by NITRA

- Flammability Tester (As per BS 5438)
  This instrument is developed as per BS 5438 and is used to determine the effect of fire on textile materials in vertical mode.
- Flammability Tester (As per IS 11871 Method A)
  This instrument is developed As per IS 11871 Method A and is used to determine flammability behaviour of textile material when specimen is placed in vertical position.
- Smoke visibility test apparatus (As per UIC code 562 – 2 Appendix 15)
  This instrument is developed as per UIC 564-2 Appendix 15 and is used to determine the effect of smoke generated on visibility.
- Fire resistant test apparatus (As per UIC code 562 – 2 Appendix 5 and 12)
  This instrument is developed as per UIC 564-2 and is used to determine the effect of fire on various materials.
- Limiting Oxygen Index Tester
  This instrument is used to determine Limiting The limiting oxygen index of textiles and plastic material. Oxygen index (LOI) is the minimum concentration of oxygen, expressed as a percentage, that will support combustion of a small vertical test specimen under specified test conditions. It is measured by passing a mixture of Oxygen and nitrogen over a burning specimen. This instrument is based on IS 13501
- Toxicity Tester
  This instrument tests the toxicity of the products of combustion in terms of small molecular species arising when a small sample of a material is completely burnt in excess air under specified conditions
- Fabric Hand Tester
  The main features of this instrument are that it Quantifies handle and results are formatted analytically and graphically which are easy to interpret.
- Dimensional Stability to Dry Heat Tester
  This instrument is very useful to determine the effect of full garment iron (dry heat) on the dimensional stability of fabric. The instrument is based on IS 12170 (referred specification IS 15853).
- Soil release efficiency Tester
  This instrument is used to determine the ability of soil release of textile material after treatment with various types of soils. The instrument is based on IS 11813 (referred specification IS 15853).

Type of Technical Consultancy Provided/Offered

The Protech COE also provides support in the following areas:

- Quality Management
- Process House Study
- Computer Aided Textile Designing
- Defect Analysis
- Product Development and its Evaluation
- Package Design Consultancy on Recovery or Treatment for Textile Effluent
- Air Quality Monitoring (Stack & Ambient)
- Pilot Plant Study for Specific Design relating to Paper & Beverage Industries
- Performance Evaluation of Textile Export House
- Electrical Energy & Safety Audit
- Thermal Energy Audit
- Thermal Insulation Audit
- Power Quality Audit
- Environmental Audits
- Air Pollution Abatement
- E.T.P Operator's Training
- Assessment of Workers Turnover & Absenteeism
- Training System Audit
- D.G. Audit
- Automation & Modification
- Steam Trap Maintenance Audit
- Humidification Audit
- Industrial Furnace Audit
- Environmental Surveys/ Rapid EIA
- Laboratory as well as pilot plant scale R & D studies on typical effluents
- Testing (analysis) of Effluent & Water Samples

List of Companies Engaged in Manufacturing of Protective Textiles

List of Indian Manufacturers

	Name	Country	Website
1.	Adigear International	India	www.adigear.com
2.	Alok Industries	India	www.alokind.com
3.	Alps Industries Ltd.	India	www.alpsindustries.com
4.	Arvind Ltd.	India	www.arvindmills.com
5.	Baswara syntax Ltd.	India	www.banswarasyntex.com
6.	Delkon Textiles Pvt. Ltd.	India	www.delkontextiles.com
7.	Jaya Shree Textiles	India	www.jayashree-iril.com
8.	JCT Ltd.	India	www.jct.co.in
9.	Kusumgar	India	www.kusumgar.com
10.	Mafatlal Industries Ltd.	India	www.mafatlals.com
11.	Reliance Industries Ltd.	India	www.ril.com
12.	RSWM	India	www.lnjbhilwara.com
13.	Shree Lakshmi Cotsyn Ltd.	India	www.shrilakshmi.in
14.	Superior Fabrics	India	www.superiorfabrics.in
15.	Surya Processors (P) Ltd.	India	www.suryatextiles.com
16.	Tarasafe International Pvt. Ltd.	India	www.tarasafe.in

List of International Manufacturers

	Name	Country	Website
1.	3 M	USA	www.3m.com/scotchlite
2.	Ames Europe	Netherlands	www.ames-europe.com
3.	Andropol	Poland	www.andropol.com.pl
4.	Argar Technology	Italy	www.argartechnology.com
5.	Baltex	UK	www.baltex.co.uk
6.	Bel Maille	France	www.belmaille.com
7.	Blucher	Germany	www.bluecher.com
8.	Boos	Germany	www.boos-textil.de
9.	British Millerain	UK	www.britishmillerain.com
10.	Burce	Turkey	www.burce.com.tr
11.	C.F. Weber	Germany	www.cfweber.de
12.	Carrington Career & Workwear	UK	www.carrington.uk.com
13.	Concordia Textiles	Belgium	www.concordiatextiles.com
14.	Dupont Safety & Protection	USA	www.personalprotection.dupont.com
15.	Engtex	Sweden	www.engtex.se
16.	Eschler	Switzerland	www.eschler.com
17.	Europrotect	France	www.europrotect.fr
18.	Everest Textile	Taiwan	www.everest.com.tw
19.	FOV	Sweden	www.fov.se
20.	Frohn	Germany	www.frohn-textil.de
21.	Gehring Textiles	USA	www.gehringtextiles.com
22.	Gelvenor Textiles	South Africa	www.geltex.co.za

	Name	Country	Website
23.	Glen Raven	USA	www.glenraven.com
24.	GTT	China	www.guobatex.com
25.	Guardiantex	Germany	www.guardiantex.com
26.	Hainsworth	UK	www.hainsworth.co.uk
27.	HDM/SuperFabric	USA	www.superfabric.com
28.	Ibena Protect	Germany	www.protect.ibena.de
29.	IBQ Fabrics	Spain	www.ibqfabrics.com
30.	JB Broadley	UK	www.jbbroadley.co.uk
31.	KAP	Germany	www.kap.de
32.	Kermel	France	www.kermel.com
33.	Klopman	Germany	www.klopman.com
34.	Kolon FM	South Korea	www.kolonfm.com
35.	Komatsu Seiren	Japan	www.komatsuseiren.co.jp
36.	Lauffenmuhle	Germany	www.lauffenmuehle.com
37.	Marina Textil S.L.	Spain	www.marinatextil.net
38.	Mectex	Italy	www.mectex.com
39.	Monotex/Shin Heung	South Korea	www.monotex.co.kr
40.	Noiret	France	www.groupe-noiret.com
41.	Norafin	Switzerland	www.norafin.com
42.	Oztek Textile	Turkey	www.oztektekstil.com.tr
43.	Performance Global Solutions	France	www.solutions-globales.com
44.	Polartec	USA	www.polartec.com
45.	Pro-Belting	Germany	www.pro-belting.com
46.	Safety Components International	USA	www.safetycomponents.com
47.	Savex Protection Textiles	China	www.savex-textile.com
48.	Schoeller Textil	Switzerland	www.schoeller-works.com
49.	Sioen Industries	Belgium	www.sioen.com
50.	Sympatex	Germany	www.sympatex.com
51.	Tencate Protective Fabrics	Netherlands	www.tencateprotectivefabrics.com
52.	Textil Santanderina	Spain	www.textilsantanderina.com
53.	Thai Taffeta	Thailand	www.thai-taffeta.com
54.	Toray Industries	Japan	www.toray.com
55.	Utexbel	Belgium	www.utexbel.com
56.	Verseidag Ballistic Protection	Germany	www.verseidagprotection.de

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Status of Newly Announced COEs

7.COE on Composites

Lead: Ahmedabad Textile Industry's Research Association (ATIRA)

Background and Information of Parent Organization(s)

Ahmedabad Textile Industry's Research Association (ATIRA) has been designated as the Center of Excellence on Composites. ATIRA's stated objective is to create a Centre of Excellence (COE) for development of advanced composites through newer and innovative processes in order to achieve weight reduction, high mechanical properties and cost competitiveness. Furthermore the goal is to enhance the knowledge base in composites through research, development and training.

Ahmedabad Textile Industry Research Association (ATIRA)

ATIRA is an autonomous non-profit association for textile research. ATIRA was established at the initiative of Dr. Vikram Sarabhai and Shri Kasturbhai Lalbhai in 1947 with the support of the textile industry of Ahmedabad. It started in 1949 after due recognition by the Council of Scientific and Industrial Research, Ministry of Science and Technology, Government of India. Later it was linked to the Ministry of Textiles.

ATIRA membership is voluntary and consists of 150 units spread all over India and abroad: comprising units engaged in ginning, spinning, weaving, process houses, composite textile units, manufacturers of fibres, dyes, chemicals, instruments, equipments and machinery.

The scientific and technological activities of ATIRA include:

- Process optimization for improved processed control leading to better quality, cost reduction and export promotion
- Development of new products, processes and design of new instruments, equipments and machinery with emphasis on industry/user collaboration/sponsorship as far as possible
- Supportive studies in areas of environmental pollution, management, human relations and policy aspects

Infrastructure Facilities

Testing Instruments

The following test instruments are available at the CoE in ATIRA for composite mechanical testing

Apparent Opening Size Analyzer

Thickness Gauge

Water Permeability: Perpendicular to the plane of the geosynthetic (without load, falling head)

Tensile Testing Machine

Water Permeability: Perpendicular to the plane of the geosynthetic (with load)

Water Permeability: In the plane of the geosynthetic (with load)

Carbon Black Dispersion Tester

Melt Flow Index Tester

Carbon Black Content Analyser

Cold Impact Chamber

Global UV 200

ATLAS Weather-o-meter

Creep Testing

Pull Out Tester

Direct Shear Box : For Friction Properties Analysis

The following test instruments are available at the CoE in ATIRA for composite mechanical testing

Dual Column Floor Mounted Electromechanical Testing System (UTM-100KN

Dual Column Floor Mounted Electromechanical Testing System (UTM-400KN)

Tension Torsion Hydraulic Machine (100KN/1KNm)

Drop Weight Impact Tester (1800 J)

Pendulum Impact Tester (25 J)

Hardness Tester

Notch Cutter (Motorised)

HDT/VICAT Apparatus

For polymers Composites elastomers, to test under tension (for films, bars, fibers), compression, shear, 3 point bending and bending double cantilever mode, with software for Master curves, Fatigue, customized waveform.

Dynamic Mechanical Analyser: DMA 150 Plus

Test Parameters

Index Testing Parameters

- Fabric Weight (GSM) ISO 9863-1& 2
- Fabric Thickness ISO 9864
- Grab Tensile Strength : (ASTM D 4632, IS 1969, ISO 13934-2)
- Width Tensile Strength (BS EN ISO 10319, ASTM D 4595)
- Trapezoidal Tear Strength (ASTM D 4533)
- Pyramid Puncture (ASTM D 5494)
- Index Puncture (ASTM D 4833)
- CBR Puncture (ASTM D 6241, ISO 12236)
- Bursting Strength (ASTM D 3786,BS EN ISO 13938-1,ISO 13938-1)
- Dynamic Cone Drop Apparatus (ISO 13433)
- UV Resistance (% Retained @ 500hrs) ASTM D 4355
- System for Measuring Resistance to Weathering (DIN EN 12224)
- Apparent Opening Size (AOS)- ISO 12956
- Porometer for Pore Size Analysis
- Falling Head Water Permeability (EN ISO 11058 and ASTM D4491-99a)
- Constant Head Water Permeability (ISO 11058)
- In-Plane Permittivity (ISO 12958)
- Protection Efficiency (ISO 13428)
- Carbon Black Content Analyzer
- Carbon Black Dispersion Analyzer
- Melt Flow Index Tester

Mechanical Testing Parameters

- Measure the load string misalignment in accordance with ASTM E1012.
- Bending strain requirement for brittle materials in Nadcap AC7101/3
- Compression, anti-buckling, fixture complying to Boeing specification support standard (BSS 7260) or SACMA recommended method (SRM-1) or ASTM D 695 (modified) standards.
- Flexural and Interlaminar Shear Bend fixture: Suitable for testing to ASTM D2344, D790, EN 2562, EN 2563, ISO 14125 and ISO 14130 with suitable anvils.
- ISO 7500-1 Class 0.5 Standard
- ASTM D7136
- D 7136 M-05
- PR-EN 6038
- AIRBUS AITM 1.0010
- ASTM D3763
- ISO 6603
- ISO 13802
- ASTM D 256
- ISO 180
- ASTM D 6110
- ASTM D6110.
- Charpy, Izod, and Tensile impact tests according to ISO 179-1, ISO 180, ISO 8256, ISO 9854, DIN 53453, DIN 53753, BS 2782-359,BS 7413, ASTM D 256, ASTM D 4812, ASTM D 6110, ASTM D 1822, ASTM E23, DIN 50115 and equivalent standards
- Heat Distortion Temperature (as per ISO 75 and ASTM D648)
- VICAT Softening Point (as per ISO 306 and ASTM D1525). Machine
- Hardness Tester: EN-ISO 6508 and ASTM E-18 and JIS Z2245

Performance Testing

- Shear Box-Friction Properties ISO 12957-1 & 2
- Pull out Tester-For Geogrid material testing for Abrasion damage simulation
- Creep Test Apparatus (ISO 13431)-The test is carried out over a long period of time. The specimens are loaded with a constant static force, in constant ambient conditions of temperature and humidity. The elongation of the specimen is recorded continuously or is measured at specific time intervals. The load is maintained for a period of 1000 hrs. If the specimen fails before 1000 hrs., the time to rupture is recorded.
- Damage during Installation: ISO 17022

Friction Behavior Of Geosynthetics In Soil

- Test Method: ISO 12957
- Test Equipment: Shear Box

Incubation Centre

Incubation Centre for Technical Textiles under CoE for Composites in ATIRA:

Dornier (190 cm width) with Texmer Creel

Dornier (340 cm width)

Dornier (430 cm width)

Jakob Muller Belt Weaving Machine (CKM)

Jakob Muller Direct Warping Machine MW400 (Beaming for Belt Weaving)

Jakob Muller Rope Weaving Machine (NC2M)

Karl Mayer Sectional Warping Machine (Opto-matic 3600mm)
(Beaming for Weaving Machines)

LACOM Machine for laminating and coating

Composite Prototype Lab for Pultrusion

Pultrusion Machine:

Pultrusion machine: with 24 in wide & 10 in tall production envelop, 20 tons of pulling power & with 06 heating zones.

Information Centre

The COE Information Centre has a comprehensive repository of books, journals and standards to enable knowledge dissemination in the field.

Books

The list of books available at the COE Information Centre is indicated below:

	Title	Author
1.	Environmental impact of textiles : Production, processes and protection	SLATER (K.)
2.	Structure and mechanics of textile fibre assemblies	SCHWARTZ (P.) ed.
3.	Textile advances in the automotive industry	SHISHOO (R.) ed.
4.	Fabric testing	JINLIAN (H. U.) ed.
5.	Geosynthetics in civil engineering	SARSBY (R. W.) ed.
6.	Physical properties of textile fibres	MORTON (W. E.) & HEARLE (W. S.)
7.	Handbook of non-woven filter media	HUTTEN (I. M.)
8.	Succeeding like success : The affluent consumers of Asia	WONG (Y. N.)
9.	Quest for global dominance : Transforming global presence into global competitive advantage	GUPTA (A. K.), GOVINDARAJAN (V.) & WANG (H.)
10.	Annual book of ASTM standards 2008 : Section 4, construction, Volume 04.13 Geosynthetics	ASTM International
11.	Brainstorming session on technological innovations in textiles, 30th April 2004 : Proceedings	Office of the Textile Commissioner, Mumbai
12.	Bio-mechanical engineering of textiles and clothing	LI (Y.) & DAI (X. Q.) eds.
13.	Medical textiles and biomaterials for healthcare	ANAND (S.), KENNEDY (J. F.) , MIRAFTAB (M.) & RAJENDRAN (S.) eds.
14.	3-D fibrous assemblies : Properties, applications and modelling of three-dimensional textile structures	JINLIAN (H. U.)
15.	Physical properties of polymers handbook	MARK (J. E.)
16.	Coated textiles : Principles and applications	SEN (A. K.)
17.	Recycling in textiles	WANG (Y.) ed.
18.	Designing with geosynthetics	KOERNER (R. M.)
19.	Handbook of technical textiles	HORROCKS (A. R.) & ANAND (S. C.) eds.
20.	Smart fibres, fabrics and clothing	TAO (X.) ed.
21.	Yarn texturing technology	HEARLE (J. W. S.), HOLLICK (L.) & WILSON (D. K.)
22.	Recent advances in textile composites (Proceedings of the 9th International conference on textile composites) : TEXCOMP9, October 13-15, 2008	ADVANI (S. G.) & GILLESPIE (J. W.) eds.

	Title	Author
23.	Cotton : Science and technology	GORDON (S.) & HSIEN (Y. L.) eds.
24.	Engineering textiles : Integrating the design and manufacture of textile products	MOGAHZY (Y. E. EI)
25.	Handbook of weaving	ADANUR (S.)
26.	Modern textile characterization methods	RAHEEL (M.) ed.
27.	Ullmann's fibers 1 : Fiber classes, production and characterization	ULLMANN
28.	Ullmann's fibers 2 : Textile and dyeing technologies, high performance and optical fibers	ULLMANN
29.	Advances in apparel production	FAIRHURST (C.) ed.
30.	Materials in sports equipment : Volume 2	SUBIC (A.) ed.
31.	Intelligent textiles and clothing	MATTILA (H. R.) ed.
32.	Fire retardant materials	HORROCKS (A. R.) & PRICE (D.) eds.
33.	3-D textile reinforcements in composite materials	MIRAVETE (A.) ed.
34.	Textile in automotive engineering	FUNG (W.) & HARDCASTLE (M.)
35.	3D fibre reinforced polymer composites	TONG (L.), MOURITZ (A. P.) & BANNISTER (M. K)
36.	Smart clothes and wearable technology	McCANN (J.) & BRYSON (D.) eds.
37.	High speed spinning of polyester and its blends with viscose : A practical guide	NANAL (S. Y.) & GARDE (A. R.)
38.	Chemical finishing of textiles	SCHINDLER (W. D.) & HAUSER (P. J.)
39.	Composite solutions thermosets and thermoplastics	REYNE (M.) ed.
40.	Composite materials in construction and civil engineering	JEC Group
41.	JEC 2009 forum proceedings : Biomaterials forum 26th March 2009, Paris	JEC Composites, Paris
42.	Strength & life of composites	TSAI (S. W.) ed.
43.	JEC 2009 forum proceedings : Wind energy forum, 24th March 2009, Paris	JEC Composites, Paris
44.	JEC 2009 forum proceedings : Civil engineering forum, 25th March 2009, Paris	JEC Composites, Paris
45.	JEC 2009 forum proceedings : Rail and road transportation forum, 25th March 2009, Paris	JEC Composites, Paris
46.	JEC 2009 forum proceedings : Aeronautics forum, 15th October, 2009, Singapore	JEC Composites, Singapore
47.	JEC 2009 forum proceedings : Wind energy forum, 15th October 2009, Singapore	JEC Composites, Singapore
48.	JEC 2009 forum proceedings : Automotive & mass transportation, 16th October 2009, Singapore	JEC Composites, Singapore
49.	JEC 2009 forum proceedings : Construction civil engineering, 16th October 2009, Singapore	JEC Composites, Singapore
50.	Main dynamics of the Asia-Pacific composite industry	
51.	Composite materials in the aeronautics industry	
52.	Composite materials in the marine industry	
53.	Composites materials in automotive	
54.	Aeronautics forum proceeding	JEC Asia 2008
55.	Automotive & mass transportation forum proceeding	JEC Asia 2008
56.	Construction & civil engineering forum proceeding	JEC Asia 2008
57.	Annual book of ASTM standards 2009 : Section 7, Volume 07.01, Textiles (i) : D 76 - D4391	ASTM International
58.	Annual book of ASTM standards 2009 : Section 7, Volume 07.02, Textiles (ii) : D 4393 - Latest	ASTM International

	Title	Author
59.	Engineering apparel fabrics and garments	FAN (J.) & HUNTER (L.)
60.	Humidification and ventilation management in textile industry	PURUSHOTHAMA (B.)
61.	Quality characterisation of apparel	DAS (S.)
62.	Aircraft textiles : Interior fabrics and air cabin fashion 25 supplier profiles	FISHER (G.)
63.	Performance apparel market issue no. 29 (TISPAM)	
64.	Design and manufacture of textile composites	LONG (A. C.) ed.
65.	Composite forming technologies	LONG (A. C.) ed.
66.	Seven macro trends in the textiles and apparel industry : Management briefing	International News Services
67.	Automotive textiles : The changing landscape for tier 1 and tier 2 suppliers : 40 Company profiles	WILSON (A.)
68.	Surface modification of textiles	WEI (Q.) ed.
69.	Sustainable textiles : Life cycle and environmental impact	BLACKBURN (R. S.) ed.
70.	Chemicals technology in the coloration of textiles : Volume 1	KARMAKAR (S. R.)
71.	Anthology of speciality chemicals for textiles	SIVARAMAKRISHNAN (C. N.)
72.	Colour technology : Tools, techniques & applications	GUPTE (V. C.)
73.	Profiles in analysis of chemicals	DESAI (N. F.)
74.	Advance in fire retardant materials	HORROCKS (A. R.) & PRICE (D.) eds.
75.	Textiles for cold weather apparel	WILLIAMS (J. T.) ed.
76.	Automation of polymer composites manufacturing	MAFELD (A.) ed.
77.	World wide composites industry : Structure, trends and innovation	JEC Composite, Paris
78.	Application of non-wovens in technical textiles	CHAPMAN (R.A.) ed.
79.	Smart textile coating and laminates	SMITH (W.C.) ed.
80.	Technical textile yarns: Industrial and medical applications	ALAGRUSAMY (R.) & DAS (A.) eds.
81.	Advances in yarn spinning technology	LAWRENCE (C. A.) ed.
82.	Polymer enhancement of technical textiles (Rapra review report no. 165), Vol. 13, No. 9, 2003	BUCKLEY (R. W.)
83.	Introduction to automotive composites	TUCKER (N.) & LINDSEY (K.) eds.
84.	Automotive composites : A design and manufacturing guide (with supplement)	Ray Publishing
85.	Opportunities in Indian composites market 2008-2013 : Trend, forecast and competitive analysis	LUCINTEL
86.	Recent advances in textile composites (proceedings of the 10th International conference on textile composites) : TEXCOMP 10, October 26-28, 2010	BINETRUY (C.) & BOUSSU (F.) eds.
87.	Medical and healthcare textiles	ANAND (S. C.), KENNEDY (J. F.), MIRAFTAB (M.) & RAJENDRAN (S.) eds.
88.	Improving comfort in clothing	SONG (G.) ed.
89.	Practical guide to the assessment of the useful life of plastics	BROWN (R. P.) & GREENWOOD (J. H.)
90.	Textiles, polymers and composites for buildings	POHL (G.) ed.
91.	Handbook of fiber science and technology Volume II : High technology fibers Part D	LEWN (M.) & PRESTON (J.) eds.
92.	Fibrous and composite materials for civil engineering applications	FUNGUEIRO ®.) ed.
93.	Composites in automotive : How far are composites materials from mass production (automotive survey)	JEC Group
94.	4th Aachen -Dresden international textile conference, 25-26, November, 2010 (book of abstracts)	International Congress Center, Dresden

	Title	Author
95.	JEC Paris 2011 proceeding composites simulation (CD)	JEC Composites
96.	JEC Paris 2011 proceeding global carbon fiber market (CD)	JEC Composites
97.	JEC Paris 2011 proceeding wind energy forum (CD)	JEC Composites
98.	JEC Paris 2011 proceeding bio-based materials forum (CD)	JEC Composites
99.	JEC Paris 2011 proceeding Nano materials forum (CD)	JEC Composites
100.	JEC Asia 2010 proceedings construction & infrastructure forum (CD)	JEC Composites
101.	JEC Paris 2011 proceeding automation forum (CD)	JEC Composites
102.	JEC Asia 2010 proceedings wind energy & environment forum (CD)	JEC Composites
103.	JEC Paris 2011 proceeding aeronautics forum (CD)	JEC Composites
104.	JEC Asia 2010 proceedings automotive & mass transportation forum (CD)	JEC Composites
105.	Composites in automotive : How far are composites materials from mass production (automotive survey)	JEC Group
106.	JEC Paris 2011 proceeding non- destructive testing global conference, March 29-31, 2011, Paris (CD)	JEC Composites
107.	JEC Paris 2010 aeronautics forum, 13-15 April, 2010 Paris (CD)	JEC Composites
108.	JEC Singapore 2011 : Automotive ground transportation forum, 18-20, October, 2011, Singapore (Innovative composites summit) (CD)	JEC Group
109.	JEC Singapore 2011 : Automotive ground transportation forum, 18-20, October, 2011, Singapore (Innovative composites summit) (CD)	JEC Group
110.	EC Singapore 2011 : Wind energy forum, 18-20, October, 2011, Singapore (Innovative composites summit) (CD)	JEC Group
111.	JEC Singapore 2011 : Infrastructure forum, 18-20, October, 2011, Singapore (Innovative composites summit) (CD)	JEC Group
112.	JEC Singapore 2011 : Aeronautics, 18-20, October, 2011, Singapore (Innovative composites summit) (CD)	JEC Group
113.	JEC Singapore 2011 : Composites design conference, 18-20, October, 2011, Singapore (Innovative composites summit) (CD)	JEC Group
114.	JEC Singapore 2011 : Automation forum, 18-20, October, 2011, Singapore (Innovative composites summit) (CD)	JEC Group
115.	Handbook of tensile properties of textile and technical fibres	BUNSELL (A. R.) ed.
116.	Handbook of sustainable textile production	TOBLER-ROHR (M. I.)
117.	Flame resistant fibres and fabrics 2011	Textile Intelligence Ltd.
118.	Vacuum infusion process (VIP) (DVD)	COCQUYT (A.)
119.	Practical guide to composites	Multi Sport Composites Ltd., Unit 2
120.	Advances in nanofibre research	HAGHI (A. K.) & ZAIKOV (G.)
121.	Flax and hemp fibres : A natural solution for the composite industry	JEC Composites
122.	Composites in construction (Building & construction Survey) 2011	JEC Group
123.	Strong features to support the lift-off, 33rd International technical conference & forum, 26-27, March, 2012, Paris, (CD-ROM)	SAMPE Europe
124.	Nanotechnology for surface coatings : Fundamentals & applications in paints & allied products	NATU (V. M.)
125.	Manufacturing processes for advanced composites	CAMPBELL (F. C.)
126.	GEOKUNSTSTOFFE IM ERD- UND VERKEHRSWEGEBAU (Geoplastics in ground- and traffic route construction)	MULLER-ROCHHOLZ (J.)
127.	Composite reinforcements for optimum performance	BOISSE (P.) ed.
128.	Annual book of ASTM standards 2011 : Section 7, Volume 07.01, Textiles (i) : D 76 - D4391	ASTM International

	Title	Author
129.	Annual book of ASTM standards 2011 : Section 7, Volume 07.02, Textiles (ii) : D 4393 – Latest	ASTM International
130.	AATCC Technical manual, Vol. 87, 2012	American Association of Textile Chemists and Colorists, (AATCC)
131.	Annual book of ASTM standards 2012 : Section 4, construction, Volume 04.13 Geosynthetics	ASTM International
132.	Certified composite technician : Basic composites study guide (ACMA), USA	American Composites Manufacturers Association
133.	Certified composite technician : Open molding study guide (ACMA), USA	American Composites Manufacturers Association
134.	Handbook of Geosynthetic engineering : Geosynthetics and their applications	SHUKLA (S. K.) ed.

Journals

The following journals are available at the COE on Composites at ATIRA:

- Textile Research Journal 2009
- Journal of the Textile Institute 2009
- Textile Progress 2009
- AATCC Review 2009
- Asian Textile Journal 2009
- Coloration Technology 2009
- Chemical Fibers International 2009
- Mellian International 2009
- Indian Journal of Fiber and Textile Research Journal 2009
- Journal of Industrial Textiles 2009
- Technical Textile International 2009
- Textile Industry of India 2009
- Textile Trends 2009
- Textile World 2009
- Textile Asia 2009
- Journal of the Indian Society for Cotton Improvement 2009
- Modern Textile Journal 2009
- Asian Textile Business 2009
- Indian Textile Journal (April 2009 to March 2010)
- Textile Month (April 2009 to March 2010)
- International Dyer (July 2009 to June 2010)
- Press Clippings Textile Industry (July 2009 to June 2010)
- Textile Horizons (July 2009 to June 2010)
- Textile Industry & Trade Journal (July 2009 to June 2010)
- Geotechnical Testing Journal 2010
- Journal of Industrial Textiles 2010
- Textile Research Journal 2010
- Journal of the Textile Institute 2010
- Textile Progress 2010
- Indian Textile Journal 2010
- Textile Month 2010
- Coloration Technology 2010
- Indian Journal of Fiber and Textile Research 2010
- Technical Textile International 2010
- Textile World 2010
- Textile Asia 2010
- AATCC Review 2010
- Textile Trends 2010
- Textile Industry of India 2010
- Asian Textile Journal 2010
- International Dyer July 2010 to June 2011
- Textile Horizons July 2010 to June 2011
- Asian Textile Business 2010
- Chemical Fibres International 2010
- Journal of the Indian Society for Cotton Improvement 2010
- Melliand International 2010
- Modern Textile Journal 2010
- Textile Industry and Trade Journal July 2010 to June 2011
- Press Clipping : Textile Industry July 2010 to June 2011

Standards

The following standards can be perused at the COE:

1.	BS EN 1149-1 : 2006 Protective clothing - electrostatic properties Part 1 : Test method for measurement of surface resistivity
2.	BS EN 1149-2 : 1997 Protective clothing - electrostatic properties Part 2 : Test method for measurement of the electrical resistance through a material (vertical resistance)
3.	BS EN 1149-3 : 2004 Protective clothing - electrostatic properties - Part 3 : Test methods for measurement of charge decay
4.	BS EN 1149-5 : 2008 Protective clothing -electrostatic properties - Part 5 : Material performance and design requirements
5.	ISO set of - TC 38/SC1, TC 38/SC2, TC 38/SC 24, TC 38, TC 221 & TC 94/SC 13 on CD-ROM
6.	BS EN 1150 : 1999 Protective clothing - visibility clothing for non professional use test methods and requirements
7.	BS EN ISO 7854 : 1997, BS 3424-9 : 1996 - Rubber or plastics -coated fabrics determination of resistance to damage by flexing
8.	BS EN 348 : 1992 Protective clothing determination of behaviour of materials on impact of small splashes of molten metal
9.	BS EN ISO 9185 : 2007 Protective clothing - Assessment of resistance of materials to molten metal splash
10.	DIN EN ISO 17070 : 2007 Leather chemical tests determination of pentachlorophenol content (ISO 17070 : 2006) English version of DIN ISO 17070 : 2007-01

11.	ISO/IS 19036 : 2006 Microbiology of food and animal feeding stuffs - Guidelines for the estimation of measurement uncertainity for quantitative determinations
12.	IS 15612 Pt. 1 : 2005 Textiles - Burning behaviour of curtains and drapes Part 1 Classification scheme
13.	IS 15612 Pt. 2 : 2006 Textiles - Burning behaviour of curtains and drapes Part 2 Measurement of flame spread of vertically oriented specimens with large ignition source
14.	IS 15612 Pt. 3 : 2005 Textiles - Burning behaviour of curtains and drapes Part 3 Method for determining the ignitability of vertically oriented specimens (small flame)
15.	IS 15612 Pt. 4 : 2005 Textiles - Burning behaviour of curtains and drapes Part 4 Method for determining the flame spread of vertically oriented specimens
16.	BS 5438 : 1989 Methods of test for flammability of textile fabrics when subjected to a small igniting flame applied to the face or bottom edge of vertically oriented specimens
17.	IS Standards
18.	IS 15758 Pt. 4 : 2000, ISO 15025 : 2000 Textiles Protective clothing
19.	IS 15061 : 2002 Automotive vehicles flammability requirements
20.	BS EN 659 : 2003 + A1 : 2008 Protective gloves for firefighters
21.	ISO 11613 : 1999 Protective clothing for firefighters - Laboratory test methods and performance requirements
22.	IS 12467 Pt. 1: 2006 Textiles - Assessment of the ignitability of upholstered furniture Part 1 Ignition source: Smouldering cigarette
23.	IS 12467 Pt. 2: 2006 Textiles - Assessment of the ignitability of upholstered furniture Part 2 Ignition source: Match flame equivalent
24.	IS 13501 : 1992 Textiles - Determination of flammability by oxygen index
25.	IS 15589 : 2005 ISO 6940 : 2004 Textile fabrics - Burning behaviour determination of ease of ignition of vertically oriented specimens
26.	IS 15590 :2005 ISO 6941 : 2003 Textile fabrics - Burning behaviour measurement of flame spread properties of vertically oriented specimens
27.	IS 15727 Pt. 1 : 2007 ISO 12952 - 1 : 1998 Textiles - Burning behaviour of bedding items Part 1 General test methods for the ignitability by a smouldering cigarette
28.	IS 15727 Pt. 2 : 2007 ISO 12952 - 2 : 1998 Textiles - Burning behaviour of bedding items Part 2 Specific test methods for the ignitability by a smouldering cigarette
29.	IS 15727 Pt. 3 : 2007 ISO 12952 - 3 : 1998 Textiles - Burning behaviour of bedding items Part 3 General test methods for the ignitability by a small open flame
30.	IS 15727 Pt. 4 : 2007 ISO 12952 - 4 : 1998 Textiles - Burning behaviour of bedding items Part 4 Specific test methods for the ignitability by a small open flame
31.	IS 15741 : 2007 Textiles - Resistance to ignition of curtains and drapes - specification
32.	IS 15742 : 2007 Textiles - Requirements for clothing made of limited flame spread materials and material assemblies affording protection against heat and flame - specification
33.	IS 15748 : 2007 Textiles - Protective clothing for industrial workers exposed to heat (Excluding firefighters' and welders' clothing)
34.	IS 15758 Pt 1 : 2007 ISO 9151 : 1995 Textiles - Protective clothing Part 1 Method of determining of heat transmission on exposure to flame
35.	IS 15758 Pt. 2 : 2007 ISO 6942 : 2002Textiles - Protective clothing Part 2 Assessment of material assemblies when exposed to source of radiant heat
36.	IS 15758 Pt. 5 : 2007 ISO 15025 : 2000 Textiles - Protective clothing Part 5 Assessment of resistance of materials to molten metal splash
37.	IS 15764 : 2008 Textiles - Determination of burning behaviour of textile floor coverings
38.	IS 15768 : 2008Textiles - Resistance to ignition of upholstered composites used for non-domestic furniture - specification
39.	IS 15781 : 2008 Textiles - Method for determination of flammability of blankets
40.	IS 15782 : 2008 Textiles - Method for determining deterioration of visibility due to smoke released on comustion of materials
41.	IS 6489 : 1993 Textiles - Woven fabrics - Determination of tear resistance by falling pendulum method
42.	IS/ISO 105 - C10 : 2006 Textiles - Tests for colour fastness Part C10 colour fastness to washing with soap or soap and soda
43.	IS 7903 : 2005 Textiles - Tarpaulines made from high density polyethylene woven fabric - Specification
44.	NFPA 1977 Standard on Protective Clothing and Equipment for Wildland fire fighting 2005 Edition
45.	NFPA 1975 Standard on Station/work Uniforms for emergency services 2009 Edition
46.	NFPA 1971 Standard on Protective Ensembles for structural fire fighting and proximity fire fighting 2007 Edition
47.	NFPA 2112 Standard on flame resistant garments for protection of industrial personnel against flash fire 2007 Edition
48.	NFPA 1992 Standard on Liquid splash protective ensembles and clothing for hazardous materials emergencies 2005 Edition
49.	DIN EN 13034 - 2009 Protective clothing against liquid chemicals - performance requirements for chemical protective clothing

	offering limited protective performance against liquid chemicals (type 6 and Type PB [6] equipment)(includes amendment A1:2009) English version of DIN EN 13034: 2009-08
50.	ASTM D 751 : 2006 Standard test methods for coated fabrics
51.	ASTM D 1603 - 06 Standard test method for carbon black content in olefin plastics
52.	ASTM D 297 - 1993 (Reapproved - 2006) Standard test methods for rubber products - Chemical analysis
53.	ASTM SEC 11 VOL. 11.03 : 2010 Water and environmental technology : Atmospheric analysis; occupational health and safety; protective
54.	ASTM E96 / E96M - 05 Standard Test Methods for Water Vapor Transmission of Materials
55.	IS 7151 : 1991 (Reaffirmed 2008)Corrugated fibre board boxes for para-dropping of supplies – Specification
56.	IS 624 : 2003 (Reaffirmed 2008) Bicycles - Rims - Specification
57.	IS 626 : 2009 Bicycles - Seat Pillars – Specification
58.	IS 2742 (Part 1) : 1994 (Reaffirmed 2009) Automotive vehicles - Break linings (Non-rubberized) Part 1 Specification
59.	IS 2742 (Part 2) : 1999 (Reaffirmed 2009) Automotive vehicles - Break linings -Rubberized Part 2 Specification
60.	IS 5352 : 1988 (Reaffirmed 1995) Specification for glass-fibre woven tape for electrical purposes
61.	IS 5746 (Part 3) : 1987 (Reaffirmed 2009) Specification for woven glass fibres fabric for plastic laminates for aerospace purposes Part 3 Finished fabrics for use with polyester resin systems
62.	IS 6218 : 2008 Bicycle - Mudguards – Specification
63.	IS 10661 : 1993 (Reaffirmed 2008) Specification for glass fibre reinforced polyester chemical resistant tank
64.	IS 11246 : 1992 (Reaffirmed 2007) Glass fibre reinforced polyester resin (GRP) Squatting pans – Specification
65.	IS 11273 : 1992 (Reaffirmed 2008) Woven roving fabrics of "E" glass fibre – specification
66.	IS 12436 : 1988 (Reaffirmed 2010) Specification for preformed rigid polyurethane (PUR) and polyisocyanurate (PIR) foams for thermal insulation
67.	IS 12643 : 1989 (Reaffirmed 2010) Corrosion protection of steel by fibre glass reinforced polyester lining - Code of practice
68.	IS 12709 : 1994 (Reaffirmed 2009) Glass fibre reinforced plastics (GRP) pipes, joints and fittings for use for potable water supply - specification
69.	IS 13620 : 1993 (Reaffirmed 2009) Fusion bonded epoxy coated reinforcing bars - specification (Incorporating Amendment No. 1)
70.	IS 14402 : 1996 (Reaffirmed 2007) Glass fibre reinforced plastics (GRP) pipes, joints and fittings for use for Sewerage, industrial waste and water (Other than potable) – specification
71.	IS 15476 : 2004 (Reaffirmed 2009) Bamboo mat corrugated sheets – Specification
72.	IS 10500 : 2012 Drinking water specification
73.	BS EN 388 : 2003 Protective gloves against mechanical risks
74.	IS 2888 : 2004 Toilet soap - Specification (Third revision) with Amendment 1- July 1986 & Amendment 2 - September 2008
75.	IS 13498 : 1997 Bathing bar Specification with Amendment No. 1 May 2002
76.	IS 286 : 1978 (Reaffirmed 1999) Methods of sampling and test for soaps (second revision) (fifth reprint July 2007, Including Amendment Nos. 1, 2, 3 & 4)
77.	BS EN 388 : 2003 Protective gloves against mechanical risks
78.	BS EN 407 : 2004 Protective gloves against thermal risks (heat and/or fire)
79.	BS EN 420 : 2003 + A1 : 2009 Protective gloves - General requirements and test methods
80.	ISO 2061 : 2010 Textiles Determination of twist in yarns - Direct counting method
81.	ISO 2062 : 2009 Textiles Yarns from packages determination of single end breaking force and elongation at break using constant rate of extension (CRC) Tester
82.	ISO 3759 : 2011 Textiles Preparation marking and measuring of fabric specimens and garments in tests for determination of dimensional change
83.	ISO 4920 : 2012 Textiles fabrics determination of resistance to surface wetting (spray test)
84.	ISO 5077 : 2007 Textiles Determination of dimensional change in washing and drying
85.	ISO 6330 : 2012 Textiles domestic washing and drying procedures for textile testing
86.	ISO 11058 : 2010 Geotextiles and geo textile related products determination of water permeability characteristics normal to the plane without load
87.	ISO 12956 : 2010 Geotextiles and geotextile related products determination of the characteristic opening size
88.	ISO 14419 : 2010 Textiles - Oil repellency hydrocarbon resistance test
89.	IS 15303 : 2003 Determination of antimony iron and selenium in water by electro-thermal atomic absorption spectrometric method
90.	IS 3025 (Part 40) : 1991 (Reaffirmed 2003) water and wastewater methods of sampling and test (physical and chemical) Part 40 - Calcium
91.	IS 3025 (Part 42) : 1992 (Reaffirmed 2009) methods of sampling and test (physical and chemical) for water and wastewater Part

	42 - Copper
92.	IS 3025 (Part 53) : 2003 (Reaffirmed 2009) methods of sampling and test (physical and chemical) for water and wastewater Part 53 - Iron
93.	IS 1350 (Part II) 1970 (Reaffirmed - 2010) Methods for test for coal and coke Part II determination of calorific value
94.	IS 1963 : 1981 (Reaffirmed - 2008) Methods for determination of threads per unit length in woven fabrics
95.	IS 3400 (Part 5) - 1986 (Reaffirmed 2008) Methods of test for valcanized rubbers part - 5 Adhesion of rubbers to textile fabrics
96.	ISO 14184 - 1-2011 Textiles determination of formaldehyde - Part 1 : Free and hydrolysed formaldehyde (water extraction method)
97.	ISO 14184-2-2011 Textiles determination of formaldehyde - Part 2 : Released formaldehyde (vapour absorption method)

Technical Manpower

1.	Dr. S. Rahman	M.Sc., Ph. D. Resin Chemistry, Nano Composites
2.	Ms. Seema Patel	B.E., M.E. (Textiles), Testing & Quality Assurance of Technical Textiles
3.	Mr. Suresh Saini	B.E. (Chemical), PGDPE (CIPET)
4.	Mr. Suketa Tyagi	B.E (Chemical), M.Tech. (Plastic Technology)
5.	Mr. Anup V. Devane	B.Text. (Textile Technology), Weaving expert (Technical Textiles)
6.	Mr. Amit Shah	B.E. (Textiles), Weaving expert (Technical Textiles)
7.	Mr. Amit Sehgal	B.Text. (Textile Engineering), Weaving expert (Technical Textiles)

R&D Projects on Technical Textiles Undertaken/Under Progress

The following projects are being undertaken at ATIRA:

- Construction related design as well as environmental design parameters for both woven and non-woven geo-synthetics
- Development of nano-fibre based textiles
- Spinning of fire retardant fibre blends on cotton system
- Development of fire retardant textiles

Training Programmes Offered

Composites Manufacturing Process (Duration 1 Month)

Foreign Collaboration Details

- ITA Aachen, Germany
- Karlsruhe Institute of Technology (KIT), Germany
- Fraunhofer ICT, Karlsruhe Germany
- Bremen Institute of Technology
- Northwest Composite Centre, Manchester, UK

Contact Details

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8.COE on Indutech

Lead: PSG College of Technology

Background and Information of Parent Organization(s)

PSG College of Technology houses the recently announced Centre of Excellence on Industrial Textiles. The COE on Indutech was sanctioned in March 2011 and the setting up of infrastructure facilities is currently underway.

PSG College of Technology

PSG College of Technology is an institution of academic excellence, founded in 1951 by PSG & Sons' Charities Trust. The emphasis of the Trust started with vocational education & production oriented industrial training. Presently, PSGCT boasts student strength of around 7000 along with 450 faculty members, with 130 doctoral qualifications.

In addition to the Centre of Excellence on Indutech, the college also has the following additional centres of excellence:

- Centre for Robotics
- TIFAC-CORE in Product Design
- Center for Supply Chain Management
- PSG Agilent Center for Advanced RF Design
- Virtual Reality Centre
- Engineering Design Laboratory
- Festo Pneumatic Centre
- Laser Centre
- Education Technology Centre
- Metal Testing and Research Centre
- Thin Film Centre
- CAD/CAM Centre,
- Virtual Instrumentation Centre
- VLSI Design Centre
- Product Development Centre
- PSG LAPP Center in Cable Technology
- PSG - L & T Center in LV Switchgear
- Audio Processing Centre
- Centre for Technology Management

Infrastructure Facilities

Testing Instruments

List of testing equipment available:

1. Air permeability tester
2. Elmendorf Fabric tearing tester
3. Digital thickness gauge
4. Contact angle tester
5. Fabric stiffness tester
6. Tensile testing machine 10 kN
7. Tensile testing machine 100 kN

List of testing equipment proposed:

1. Auto burst bursting strength tester
2. Hydrostatic head tester
3. Water vapour permeability and Thermal conductivity tester
4. Weatherometer
5. Water Permeability testerThermal resistance tester
6. FTIR Spectrometer
7. UV Spectrometer
8. Viscometer
9. pH meter

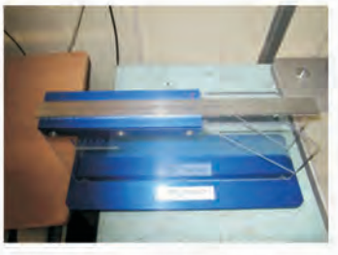
10. Digital Hot air oven
11. Hot plate with stirrer
12. Impedance tester
13. Moisture management tester
14. Automatic Flammability tester(Horizontal, Vertical & Inclined)
15. Water repellency tester
16. FE SEM
17. Conditioning chamber
18. Abrasion tester (Taber- Rotary type)
19. Analytical balance
20. Friction Tester
21. Electrical surface resistivity for the fabric
22. Spray rating tester

Images of Testing Machines

Testing machines available at COE Indutech

Contact Angle Tester

Air Permeability Tester



Stiffness Tester

Elmendorf Tearing Tester

Digital Thickness Gauge

Machines

List of machines available:

1. Needle punching line

List of machines proposed:

1. Needle punching line for coarser natural fibres
2. Melt coating and lamination line
3. Chemical coating line
4. Chemical bonding line
5. Hot air oven
6. Rope making machine
7. Braiding machine
8. Electro spinning machine
9. Yarn coating machine
10. Wet wipe manufacturing machine

Information Center

Books

List of Books available at Information Center:

S.No	Book Title
1	Application of Nonwovens in Technical Textiles
2	Handbook of Nonwovens
3	Smart Textile Coatings and Laminates
4	Fibrous & Composite Material for Civil Engineering Application
5	Advanced Textiles for Wound Care
6	Handbook of Nonwoven Filter Media
7	Absorbent Technology Vol.13
8	Technical Textile Yarns
9	Coating Technology Handbook
10	Nonwovens Fabrics Raw Materials Applications Testing Processes

List of Books Proposed For Information Centre:

S.No	Name of the Book
1	Handbook of Natural Fibres Vol. 1
2	Handbook of Natural Fibres Vol. 2
3	Modification of Fibres for Technical Applications
4	Composites Forming Technologies
5	Handbook of Technical Textiles
6	Automotive Textiles
7	Textile Terms & Definitions
8	Wellington Sears Handbook of Industrial Textiles
9	Advanced Technical Textile Product
10	Coatings of Polymer & Plastics
11	Industrial Applications of Natural Fibers
12	ASTM Volume 07.01 Textile Vol. 1
13	ASTM Volume 07.02 Textile Vol. 2
14	Absorbent Incontinence Products
15	Thermal Bonding of Nonwoven Fabrics
16	Industrial Applications of Textiles
17	Standard Test Methods for Determining Average Grain Size
18	Test methods for nonwovens
19	Textiles in Automotive Engineering
20	Bast & Other Plant Fibers
21	Regenerated Cellulose Fibres
22	Handbook of Textile Fibres Natural Fiber Vol. 1
23	Improving comfort in clothing
24	Functional textiles for improved performance, protection and health
25	Handbook of sustainable textile production
26	Advances in textile biotechnology
27	Fibrous and composite materials for civil engineering applications
28	Advances in yarn spinning technology
29	Textile Design : Principles, advances and applications

30	Woven textile structure: theory and applications
31	Computer technology for textiles and Apparel
32	Technical textile yarns: industrial and medical applications
33	Fatigue failure of textile fibers
34	Eco textiles: the way forward for sustainable development in textiles
35	Specialist yarn and fabric structures: developments and applications
36	Medical and healthcare textile
37	Advances in knitting technology
38	The sewing book: Dress making, soft furnishing, best tools. Step by step technique, creative projects.
39	High performance fibers: textile Progress volume 25 number ¾ (P/B
40	Fashion retail:2nd edition
41	Narrow fabrics group conference (p/b)
42	Wet laid and short fiber airlaid nonwovens (p/b)
43	Handbook of fiber science and technology: volume III high technology fibers part D
44	Theory of structure and mechanics of fibrous assemblies
45	hermal and moisture transport in fibrous materials
46	Micro structural Characterization of Fibre-Reinforced Composites
47	Textiles in Automotive Engineering
48	Coated and Laminated Textiles
49	Harmonized Test Methods Nonwovens 2010-HardCopy and CD
50	The Nonwoven fabrics Handbook
51	Spun bonded and Melt Blown Technology Handbook
52	Needle punch nonwoven primer
53	Filtration Technology Handbook
54	Air laid Pulp Nonwoven Primer
55	Standard Test methods for Nonwoven
56	Automotive Textiles textile progress Vol.29 number 1/ 2
57	New fibres 2nd Edition
58	Coated Textiles - Principles and Applications 2nd Edition
59	Indian Nonwovens outlook
60	Nonwoven fabrics
61	Handbook of textile Fibre Structure,Vol-1: Fundamentals and manufactured polymer fibres
62	Handbook of Textile Fibre Structure,Vol-2:Natural.Regenerated,Inorganic and Specialist Fibres
63	Film Formation in Coating : Mechanisms, Properties and Morphology
64	Textile Coating & Laminating, 6th International Conference
65	Textile Coating & Laminating : Technology Driving the Future
66	Developments in Non-woven Fabrics
67	Standard Test Methods for Nonwoven Industry BY: INDA and EDANA
68	Smart textile coatings and laminates

Standards

ASTM Standards
1. Standard test methods for determining average grain size
2. ASTM Volume 07.01 Textiles (I): D76 D4391
3. ASTM Volume 07.02 Textiles (II): D4393
B S Standards
1. Test methods for non-wovens. Determination of resistance to penetration by water (hydrostatic pressure)

INDA Standards
1. Harmonized test methods for the non-wovens & related industries
2. Standard test methods for the non-wovens and related industries
3. Individual non-woven standard test methods
4. Principles of non-wovens

Technical Manpowers

Sr No.	Name	Designation	Full Time/Part Time	Qualification
1.	Dr.R.Rudramoorthy	Director	Part Time	M.E. Ph.D
2	Dr.G.Thilagavathy	Joint Director	Part Time	M.Tech, Ph.D.
3	Dr.S.Neelakrishnan Subramanian	Joint Director	Part Time	M.S., Ph.D.
4	Mr.R.G.Shekar	Centre Head,	Full Time	B.Tech
5	Mr.V.Muthukumar	Project Engineer ,	Full Time	M.Tech,MBA
6	Mr.R.Jayaprakash	Project Engineer,	Full Time	B.Tech.
7	Mr.T.Karthik	Asst. Professor.	Part Time	M.Tech.
9	Mrs P Kandavadivu	Associate Professor	Part Time	M.Tech. Phd.
10	Mr S Parthasarathi	Asst. Professor	Part Time	M.Tech
11	Mr R Ramachandran	Asst. Professor	Part Time	M.Tech
12	Mr R Surjit	Asst. Professor	Part Time	M.Tech
13	Mr N Muthukumar	Asst. Professor	Part Time	M.Tech
14	Mrs K J Vishnu Vardhini	Asst. Professor	Part Time	M.Tech
15	Mr S Karthikeyan	Asst. Professor	Part Time	M.S
16	Mr M P Bharathimohan	Asst. Professor	Part Time	M.E.
17	Mr Benjamin S Davidson	Asst. Professor	Part Time	M.E.
18	Mr R Karthikeyan	Asst. Professor	Part Time	M.Tech
19	Mr.Gunashekar	Mechnanical Asst.,	Full Time	ITI
20	Mr.Chandrashekar	Electrical Asst.,	Full Time	ITI

R&D Projects on Technical Textiles Undertaken/Under Progress

The following projects on Industrial Textiles are currently underway at the COE:

- Development of natural fiber non-wovens for acoustic applications
- Development of jute/wool blend non-wovens
- Development of natural fibre non-wovens for application as car interiors for noise control
- Bamboo blended non-wovens for automobile interiors
- Utilisation of chicken feathers for the development of non-wovens and value added products
- Development of natural fibre non-wovens for application as car interiors
- Production of an hydrophobic oleophilic kapok non-woven fabric for its potential application
- Analysis of natural non-woven geotextiles used in erosion control.
- Design & development of non-woven products using recycled fibres
- Non-woven textiles as health care products
- Development of odour free antimicrobial hospital linens
- Production and properties of non-wovens using comber noils
- Design and development of home textiles using non-woven fabrics

Training Programmes Offered

- One day Workshop on "Industrial Technical Textiles – Products, Application & Testing" on 17 August 2011.
- One day National conference on "Protective Textiles" on 25th Jan 2012.
- One Day workshop on "Manufacture and Marketing of Wipes" on 16.03.2012
- One Day workshop on "Coated, Flocked and laminated Textiles" on 30th June 2012.
- One day" STAKE HOLDERS MEET Cum Entrepreneur development program on "BUSINESS OPPORTUNITIES IN FILTRATION TEXTILES" on 2nd August 2012.
- Two Day International conference on "Industrial Textiles (Indutech-2012) on Industrial Textiles Products, applications and prospects" on 3rd and 4th August 2012

Imeges: Training Programs Offered

EDP on Manufacture of Textile Coated, Flocked and Laminated Textiles

STAKE HOLDERS MEET Cum Entrepreneur development program on "BUSINESS OPPORTUNITIES IN FILTRATION TEXTILES"

International Conference (Indutech 2012)

International Conference (Indutech 2012)

National Conference on Protective Textiles

Visits carried out for Technical Knowledge Upgradation

Following visits were carried out for Technical knowledge up gradation:

1. M/s. Supreme Nonwovens Pvt Ltd, Mumbai.
2. M/s. Birla Cellulose Pvt ltd, Surat.
3. M/s. TATA Nonwovens Pvt Ltd, Mumbai
4. M/s. Grindwel Norton Pvt Ltd, Bangalore.
5. M/s. SRF Ltd, Gummidipoondi and Manali.
6. M/s. Elofic Filter, Faridabad.
7. M/s. Sterling Nonwoven Ltd, New Delhi.
8. M/s. Nuovafil & Infoteck Pvt ltd. Coimbatore.
9. Visited to MANTRA, NITRA and BTRA

Programmes attended

1.Participated in Symposium on Woven Filtration and Geotextiles at Mumbai on 18th October 2012.

Foreign Collaboration details

PSG Tech's COE on Indutech is in the process of executing MOUs with two leading international institutions regarding technical consultancy. The institutions are:

1. University of Bolton, UK; and
2. Technical University of Liberec, Czech Republic

Indutech Prototypes to be developed

The incubation centre for Indutech COE will support the innovators to access funds and technical know-how for the development of prototypes and also support them during the establishment of production facilities.

Indutech COE will also actively engage in training of students, faculty members of academic institutions and technicians from the industry to create awareness and knowledge about the technical textiles field as a whole. Short term courses shall be offered round the year to suit the requirements of the industry.

Contact Details

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9.COE on Nonwovens

Lead: DKTE Society's Textile & Engineering Institute (DKTE)

Background and Information of Parent Organization(s)

DKTE

The D.K.T.E. Society's Textile & Engineering Institute was founded in 1982. It is based in Ichalkaranji (popularly known as 'Manchester of Maharashtra') which is one of the prominent hubs of the decentralized textile segment. The Institute has 8 departments, 175 full time academic staff and 2960 full time students.

The Institute is engaged in a wide array of activities as summarized below:

- Academic
- Research and Development Activity
- Consultancy (Trouble shooting, Turn key projects, Project appraisal)
- Training for Industry (Management, Technical man power, Machine Technician and Operators)
- Testing Facilities
- Seminars/ Workshops and Conferences (Dissemination of Technical knowledge and information)
- Training and Placement for Students
- Co-curricular activities for Students (Paper presentation contests, Project Contests, Quiz Contest etc.)
- Entrepreneurial Development Activity and Business Incubation

In addition to the Centre of Excellence in Nonwoven, the college also has the following additional Government funded projects:

Sr. No	Name of the Projects	Sponsoring Agency
1.	Centre of Excellence in Nonwovens	Government of India, Ministry of Textiles
2.	Technology Information, Forecasting & Assessment Council (TIFAC)	Department of Science & Technology, Govt. of India
3.	DKTE Technology Business Incubation (TBI)	Department of Science & Technology, Govt. of India
4.	Science & Engineering Research Council	Department of Science & Technology, Govt. of India
5.	Testing of Nonwovens	Department of Science & Technology, Govt. of India
6.	MODROB (for PCB Software	AICTE, New Delhi
7.	Robotics Research Lab	MHRD, New Delhi & IIT, Bombay
8.	Ministry of Micro, Small & Medium Enterprises (MSME)	Ministry of Micro, Small & Medium Enterprises,Govt. of India
9.	Entrepreneurship Development Cell	AICTE, New Delhi
10.	Industry Institute Partnership Cell (IIPC)	AICTE, New Delhi
11.	Technology based Entrepreneurship Programme	DST New Delhi & EDI, Ahmedabad
12.	National Conference on Recent Trends in Electronics and Tele- Communication Engg	AICTE, New Delhi
13.	National Conference in Electronics and Communication Engg	DRDO, New Delhi
14.	Faculty Development Porgramme	AICTE, New Delhi
15.	Industrial Product Design Center under Nationally Coordinated project (NCP) Scheme	AICTE, New Delhi

Infrastructure Facilities

Testing Instruments

In the Phase – I of the procurement, the following testing equipment were received

S.No.	Name of the Instrument	S.No.	Name of the Instrument
1.	Microscope with microtome	12.	Fiber orientation web measurement
2.	LOI tester	13.	Liquid strike through time and wet back property of nonwoven
3.	Digital tearing strength tester	14.	Linear density & fibre crimp – measurement
4.	Hydrostatic water head tester	15.	Pore size analyzer
5.	Digital bursting strength tester	16.	Water transmissivity tester
6.	Digital thickness tester	17.	Gradient ratio test apparatus
7.	Air permeability tester	18.	Direct shear box
8.	Water Vapor Transmission Rate Tester	19.	Thermal conductivity tester
9.	Water repellency tester	20.	Universal testing machine
10.	GSM tester	21.	Melt flow index
11.	UV accelerated weathering tester	22.	Particle size analyser

In addition to the above, the Institute already has the following technical textile testing instruments and manufacturing machineries

Mathis Lab Coating Machine

Digital Bursting Strength Tester

Vertical and horizontal Flameability tester

Banana Fibre Extractor

Universal Tensile Testing Machine With Compression, Ball & Puncture Attachment

Carl-Zeiss Microscope

Universal Wear Tester

Sulzer Projectile

Dornier Rapier

Incubation Center

COE Nonwoven proposed to procure the following manufacturing machineries for the Incubation centre

Sr. No.	Machineries
1	Needle Punching Line
1	Spunlace Line
2	SMS Line
3	Coating and Lamination Line
4	Calendaring Machine
5	Fibre Retreiving line
6	Fusing machine
7	Moulding machine
8	Fabric inspection m/c
9	Curing chamber (thermal- bonding)
10	Chemical sprayer
11	Chemical saturator

Information Center

The COE is equipped with the following literature and aligned resources.

List of Books

Sr. No	Books
1	Advanced Fibres Spinning Technology - by T. Nakajima
2	Composites materials : Engineering & Science by F. L. Matthews & R. D. Rawlings
3	Medical Textile & Bio-materials for health care
4	Textiles in Sports
5	Military Textiles

6	Materials in Sports Equipment
7	Smart Textiles : Coatings & Laminates
8	Turbology of natural fibre polymer composites
9	Smart Textiles for Medicine and health care
10	Biodegradable & sustainable Fibre
11	Properties and performance of natural fibre composite
12	Engineering Textiles
13	Structure & Mechanics of Woven fabric
14	Identification of Textile Fibres
15	Clothing Biosesory Engineering
16	Chemical Finishing of Textiles
17	Textiles for cold weather apparel
18	Environmental impact of Textiles
19	Biomedical engineering of textiles and clothing
20	Ecotextiles
21	Textiles for Protection
22	Fundamentals and Practices in Colouration of Textiles
23	Physical Testing of Textiles
24	Handbook of Textile fibre structure
25	Performance of Home Textiles
26	Clothing appearance and its science and technology
27	Design and Manufacture of Textile Composites
28	Integrated Design and manufacture using fibre-reinforced polymeric composites
29	Surface modification of Textiles
30	Smart Textile Coating and Laminates
31	Textile for Cold Weather Apparel
32	Advances in Apparel Production
33	Tribology of Natural Fiber Polymer Composites
34	Biological Inspired Textiles
35	Fabric Testing
36	Nanofibres and Nanotechnology in Textiles
37	Handbook of Nonwoven
38	High Performance Fibres
39	Coated and Laminated Textiles
40	Plasma Technologies for Textiles
41	Thermal Moisture Transport in Fibrous Materials
42	Green composites: Polymer Composites and the Environment
43	Intelligent Textiles and Clothing
44	Textiles for Protection by R.A. Scott
45	3-D Textile Reinforcements in composite materials by A. Miravate
46	New Fibres by T. Hongu & G.O. Phillips
47	Hand Book of Technical Textiles by A. R. Horocks
48	Composites Forming Technologies by A.C. Long
49	Fire Retardant Materials by A. R. Horoocks & D. Price
50	Effects of Mechanical & Physical properties on fabric hand by H. M. Behery
51	Handbook of Nonwovens by S.J. Russell
52	Chemical Testing of Textiles by Qinguo Fan
53	Micro structural Characterization of Fibre-reinforced Composites by John Summer scales
54	New Millennium Fibres by Tatsuya Hongu & Glyn O. Phillips
55	Plasma Technology for Textiles by Roshan Shishoo
56	Clothing Bisensory Engineering editd by Y.L. and A.S. W Wang,

57	Smart Fibres,Fabrics and Clothing edited by Xiaoming Tao
58	Medical Textiles 96
59	Coated Textiles, Principles and Applications
60	Chemical Principles of Synthetic fibre Dyeing
61	Geotextile by N W M John
62	Chemical Principles of Textile Conservation
63	Textile Testing: Physical, Chemical & Micoscopical
64	Mechanics of Textile & Laminated Composites by A.E. Bogdanovich & C.M. Pastore
65	Manufactured Fibre Technology
66	Handbook of Advance material testing
67	Fiber Chemistry
68	Engg in Textile Coloration
69	Mass Spectrometry
70	New Fibers by Tatsuya Hongu & Glyn O. Phillips
71	Chemical Technology in the pre-treatment processes of Textiles
72	Handbook of Nonwoven Filter Media
73	Natural Dyes for Textiles & their Eco-friendly Applications
74	Testing and Quality Management Vol.1
75	Theory and Practice of Water & Wastewater Treatment by Ronald L. Droste
76	Analytical Chem. By Open Learning - 34 Volumes
77	Wastewater Microbiology
78	Polyimide : Fundamentals & Applications
79	Fibre Reinforced Composites by P. K. Mallick
80	Polymer Chemistry the basic Concepts by Hiemenz Paul C.
81	Chemical Processing of Fibers and Fabrics Functional Finishes by Menachem Lewin
82	Modern Textile Characterization Methods By Mastura Raheel
83	Chemical Technicians' Ready Reference Handbook
84	Juran's Quality Handbook
85	Polymer Data handbook
86	Encylopedia of Nanoscience & Nanotechnology by Dr. Parag Diwan & Ashish Bharadwaj
87	Textile Testing & Analysis by B. J. Collier
88	Risk Assessment of Chemicals in the Environment
89	Textile Finishing by Derek Heywood
90	Micro Manufacturing & nano technology
91	Waste Water Treatment
92	Textile Chemicals Environmental data & facts
93	Membrane Separation Processes
94	Coated Textiles by A. K. Sen
95	Wellington Sears Handbook of Industrial Textiles by Sabit Adnur
96	Physical Properties of Textile fibres
97	Physical Properties of Textile Fibres by Morton W.E. & Hearle J.W.S.
98	Coated Textiles, Principles & applications by A. K. Sen
99	Ullmann's Fibres Vol.1 & 2 by Wiley-VCH

List of Journals:

Sr. No	Name of journal
1	AATCC Review
2	Clothing & Textile Research Journal
3	Coloration Technology
4	Family & Consumer Sciences Research Journal

5	International Journal of Materials Research
6	Melliand International
7	Sportswear International
8	Textile Network (Magazine)
9	Non-Woven & Technical Textiles
10	Future Materials
11	Asian Technical Textiles
12	Geosynthetics
13	Journal of Natural Fibers
14	Research Journal of Textile & Apparel
15	Journal of Textile Institute
16	Journal of Textile & Apparel, Technology & Management
17	Autex Research Journals
18	Journal of Engineered Fibers & Fabrics
19	Chemical Fibers International
20	Texhnical Textiles International
21	Technical Textiles
22	Journal of Industrial Textile
23	Journal of Composite Material
24	Textile Research Journal

List of Manuals

Sr. No.	Name of manual
1.	ASTM Textile Standards 7.01 & 7.02
2.	Analytical Methods for Textile Laboratory
3.	Annual Book of ASTM Standards on Textile Section .07
4.	ASTM Volume 07.01 Textiles (I): D76 - D4391
5.	ASTM Standards (978-0-8031-8561-6) for Water & Environment Technology
6.	ASTM Volume 13.01 (978-0-8031-8585-2)
7.	ASTM Volume 07.02 Textiles (II): D4393
8.	ASTM Standards Section 15 (978-0-8031-8600-2)
9.	Nonwoven Structures for Absorption of Body Fluids by Jacek DUTKIEWICZ
10.	EN 12447-Geotextiles & geotextile-related products
11.	EN 13361 - Geosynthetic barriers
12.	BIS STANDARD

Technical Manpower

Sr No.	Name	Designation	Qualification
1	Prof. C A Patil	Professor	M. Tech. + 29 yrs Exp.
2	Prof (Dr.) A I Wasif	Professor	M.Sc. Tech, Ph.D. Tech + 28 Yrs Exp.
3	Dr. S B Vhanbatte	Associate Professor	M. Tech., Ph.D. + 8 yrs exp.
4	Mr. S S Aparaj	Assistant Professor	M. Text. + 6 yrs Exp.
5	Mr. Pradip Ingale	Jr. Scientist	Pursuing M. Tech + 12 Yrs. Exp.
6	Mr. Abhay Shetti	Sr. Clerk	B. Com + 20 Yrs Exp.

IT Centre

1	Desktop Pc-25	5	Blader Server
2	Software	6	Colour & B/W Printer
3	Wireless Access Point	7	Video Conferencing Facility
4	Scanner	8	High Speed Camera

High Speed Camera

The high speed camera proposed is having specifications like Frame rate 50,000 with 128X16 pixel resolution, 12-bit ADC Sensor with 20 µm pixel; 1µs maximum shutter speed. Also contains video output and camera controls, Dual Speed Recording, Capture 12-bit uncompressed data; 8GB, 16GB or 32GB memory options and Low Light Mode.

High speed cameras are basically to capture the very high speed and short duration processes for detailed analysis which will be played back as a slow motion picture. High speed cameras are advanced imaging systems which are a vital part of all engineering research institutes and has a wide base of applications including mechanical studies, machining application, material testing, machine vision, combustion, fluid mechanics and many more.

R&D Projects on Technical Textiles Undertaken/Under Progress

- Geotextiles in Nonwoven application in paved road and unpaved road: non-woven needle punched polypropylene fabric - Ichalkaranji Nagarpalika, Ichalkaranji.
- Endless fabric belt for weighing machine - Tetra Pak, Nickrom, Pune
- Industrial fabric for military - Sunil Industries, Mumbai
- Development of filter fabric for vacuum cleaner- Modi Hoovers Ltd., New Delhi
- 1000d geotextile fabric-Marex Geogrids, Pune
- 20 x 30 peroxide bleached fabric for medical textiles-Sultanpure Textile Mills, Ichalkaranji (Johnson & Johnson, Mumbai)
- Development of needle punched Nonwoven fabric products from banana fibre
- Coir Nonwoven with cement composites
- Novel application of kapok fibre Nonwoven for recovery of oil spill
- Development of Nanometal oxide coated cotton fabrics with improved UV protection
- Development of antibacterial and conductive fabrics using nano-ZnO
- Investigating the modification of textile using plasma
- Development of flame retardant fabrics for school children along with Kumarguru College of Technology, Coimbatore

- Study of performance characteristics of sugarcane fibre composites.
- Studies in wound care & bandages
- Studies in Moisture Management in textiles
- Application of Nanotechnology in Textile Finishing
- Studies in application of super absorbent polymers on textiles.
- Coating of nonwoven materials for specialty applications.
- Studies in surgical non-woven Gown.
- Natural Fibres as Reinforced material in false ceiling.
- Studies in nonwoven fabrics for water filtration.
- Studies in nonwoven air filter fabrics.
- Microencapsulation technique for technical textiles.
- Application of Chicken Feather.
- Studies on fiber reinforced concrete.

Training Programmes Offered

- Various aspects of Technical Textiles, May 5, 2009 to May 7, 2009
- Weaving of Technical Textiles, June 8, 2009 to July 22, 2009
- Weaving of Filter fabrics-Costing & Marketing for Entrepreneurs in and around Ichalkaranji, September 20, 2009

Foreign Collaboration

Communication held with following for collaboration activities.

1. Thiland Textile Institute, Bangkok
2. Tampere Universty of Technology, Finland
3. Mascow State Textile University, Russia
4. Institute of Textile Technology and Process Engineering, Germany
5. CTT Group Canada
6. LIUC University, Castellanza, Itali
7. Technical University of Liberec, Czech Republic
8. Fraunhofer Institute of Chemical Twechnology, Germany
9. Niederrhein University, Germany
10. Ahlstrom Nonwovens, USA
11. Textile BioEngineering and Informatics Society, Hongkong
12. RWTH Aachen University Germany
13. Swiss Textile College, Swistzerland
14. CETEX Institute for Textile Processing Machinery , Germany

Details of Prototypes Developed

1. Filter Fabric for recycling of Textile Effluent
2. Herbal wound bandages
3. Conductive textile nonwovens as an Actuators
4. Coir composite roofing panels
5. PP homo-composite for crack resistant

Knowledge and Industry Partners

DKTE has associated with the following organizations for the COE on Nonwovens:

Knowledge Partners

1. Eastern Michigan University, USA
2. Texas Tech University, USA
3. Association of Nonwoven Fabrics Industry (INDA), USA
4. NWTEXNET Ltd., UK

Industry Partners

1. SVM Nonwovens Pvt. Ltd., Hyderabad
2. Ruby Surgical & Allied Products Pvt. Ltd., Jalgaon
3. Reliance Industries Limited, Patalganga, Maharashtra
4. Deegee Cotsyn Pvt. Ltd., Amravati
5. Anjani Nonwovens, Kolkata
6. Sri Bhagirath Textile Ltd., Nagpur
7. Suvin Advisors Pvt. Ltd., Thane
8. SVG Fashions Limited, Daman
9. Ujwal Texprints, Sangli
10. Mahlo GmbH and Co. KG, Germany
11. Zenith Fibres Pvt. Ltd., Baroda
12. Obeetee Textile Pvt. Ltd., Mirzapur

Contact Details

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10.COE on Sportech

Lead: Wool Research Association, Thane

Background and Information of Parent Organization(s)

Wool Research Association, Thane

The Wool Research Association, Thane, an autonomous co-operative Research organization under Society's Act and linked to Ministry of Textiles, GOI, was established in the year 1963 by the Woollen Textile Industry in close association with the union government of India. WRA as a society registered under the societies Registration Act XXI 1860 having its central office at Kolshet Road, Thane, Maharashtra.

WRA as an organization is committed to provide technological and scientific solutions to the woollen sector in particular and textiles industry in general besides meeting the super-ordinate goals of scientific and Technological advancements set by the industry leaders and policy makers in India. In this pursuit, the organization has imprinted its own standards to obtain the accreditation of the international status as a R&D institution apart from providing solutions to various technical and techno-economic problems faced by the industry in a very cost effective mechanism and with quick response time.

Major Activities of WRA:

- Research & Development
- Testing/Evaluation Service to the Industry, Export Oriented Organizations, Government Organizations etc.
- Colour Technology (CAD/CAM)
- Training & Education
- Research in the emerging technologies like Technical Textiles, Plasma & Nanotechnology, Phase Change materials, IT, Smart Textiles, Supercritical processing etc.
- Technical Service to the Decentralized Carpet Industry, SMEs, Cottage/Rural industry etc.
- Technology Development in Woollens & Manmade Textiles
- Consultancy
- Technical Survey & Audit of Industrial Units
- Technical Feasibility Report Formulation
- Turnkey Projects

Since last two decades, Wool Research Association had modestly engaged itself in the development of technical textiles. It has foreseen the significance of this emerging technology. It had undertaken a few sponsored projects relating to Sportech, Indutech, Mobiltech, etc.

Of late Sportech products have assumed added significance for the following factors:

- Increased activities and participation in sports in the country.
- Outdoor leisure pursuits.
- Availability of high performance fibres, new technologies of coatings and manufacturing processes.
- Higher level of sports standard and challenges within sporting nations.
- Newer sports requiring high dexterity, skill and sporting gears.
- New interest of the youth for outdoor activities and leisures.
- Popularity of traditional sports like athletics, soccer, cricket, skiing, golf, sailing, etc., in the country.
- Growth of sports facility in the country.

Considering the importance, scope and significance of this sector viz Sportech, it is considered expedient to face the challenges of new development, global competition, existing visible gap, technological parameters like globally accredited testing, HRD, prototype development facilities and scaling up of the production, dissemination of information to the stake holders, increasing interest of Indians in sports, etc. WRA having highly qualified excellent team of Scientists and Technologists and modest experience in technical textiles sectors, has ventured, creating facilities of a Centre of Excellence in Sportech.

Mission:

- To build a complete institution that supports high quality research and product development on sports textiles for the growth of textile industry.
- To provide a platform for the industry where they can develop new products, upgrade their existing products and provide them pilot scale facilities for sample development and technology transfer.
- To provide world class facilities for testing of technical textile materials as per the relevant international standard test methods and to develop new test methods where there are not available.
- To encourage and assist new entrepreneurs in the sports textiles sector by providing support in project planning, execution, production, and various aspects of management.
- To organize training programmes from time to time for the technical and managerial staff of the sports textile industry to meet the requirements of the industry
- To organise workshops, seminars and conferences to impart / transfer the knowledge to the industry.
- To impart education in sports textiles to the students of the various institutions/ industry personals so that they are ready for the sports textile industry.

Objectives:

- The basic objective of Centre of Excellence is to provide infrastructure and facilities at one place for the convenience of the manufacturers of sports textiles. COE facilities will motivate potential entrepreneur.
- To provide such facilities, it would be necessary to establish suitable laboratory, product, process & prototype development facilities, Sample Bank, competent manpower, training facilities, incubation centres, etc in the identified sector of Sportech.
- The purpose of COE is to provide facilities to the entrepreneurs in one hand and the suitable products to the users on the other, so that comparatively near. sector develops with Govt. support and initiative, till this value added sector stands on its own feet to survive and thrive, subsequently having an impact on textiles industry and economy of the country.
- Conceptually, the COE would offer its facilities, knowledge, research support, HRD, consultancy, etc to serious entrepreneurs who would venture into this emerging technology.
- Incubation of new ideas into practical tradable products, dissemination of information through workshop, seminar, etc also will be within the activities of COE.

Veermata Jeejabai Technological Institute (VJTI)

- An Institute engaged in Textile education and other disciplines of Engineering & Technology for last 125 years.
- Equipped with modern laboratories, pilot plants.
- Education & training facilities offering various courses in Engineering & Technology leading to Diploma, Degree, Post Graduate Degree and Ph.D.
- Textile Department is equipped with 24 testing equipment, 32 major Spinning & weaving machines, Fibre & Yarn Development Lab, Fabric Development Lab, Physical Testing Lab and Chemical Testing Lab.
- 19 published papers in Technical Textiles over last 10 years.
- Highly qualified 21 Professors/ Assistant Professors as faculties.

Kusumgar Corporates Pvt. Ltd.

- Forefront Technical Textile Manufacturer for last two decades (Geotech, Indutech, Sportech, High Altitude Clothing, Protech, etc)
- Seven highly qualified technocrats and large number of industrial staffs & workers
- Three factories at Umbergaon, Vapi, Paldi with latest weaving, processing & coating facilities for technical textiles.
- Manufacturer of Defense Textiles like Parachutes, high altitude clothing, Awning, Tarpaulins, Uniforms and Industrial

Infrastructure Facilities

Testing Instruments

The following instruments are under procurement to facilitate the objectives of the COE:

Name of the machinery / equipment	Specific purpose
AFC 45° Automatic Flammability Tester	To determine the burning characteristics of textiles materials under controlled conditions.
Air Permeability Tester	To determine the resistance of fabrics (woven, knitted and non woven textile materials) to the passage of air.
Flammability Tester	To determine the flammability resistance of vertically oriented fabrics.
Busting strength tester	To determine the bursting strength and distension at burst of woven, knitted and non woven fabrics, papers.
Hydrostatic Head Tester	To determine the resistance of fabrics (coated, uncoated & non wovens) to water penetration. To determine pore size of textiles
Rain Tester With 2400mm Column	To determine the penetration resistance of fabrics or composites at different intensities of water impact.
Digital Elmendorf Tearing Tester	A microprocessor controlled falling-pendulum instrument to determine the ballistic tearing strength of textiles, plastics, paper or board.
Digital Thickness Gauge	For thickness & Compressibility Testing
Universal strength tester	For the measurement of strength and elongation of the textiles.
Thermal Tester	To characterize polymer behavior at high temperatures, measuring the heat deflection
Universal weathering testing instrument	Universal weathering instrument for testing the light fastness and weather ability of materials.
Oxygen Index Test Apparatus	Digital readout of oxygen concentration to ± 0.1%.
Dry Guarded Hotplate	The Dry Guarded Hotplate system was designed to measure the thermal resistance (R-value) of fabrics
Universal wear tester	To determine the wear and abrasion resistance of the industrial fabrics
Pneumatic sample cutter	For sample preparation
Toxicity Index	To measure toxicity Index of coated textiles
Ultra Violet Condensation Test Apparatus	To determine the UV resistance of coated fabric
Evenness Tester	Measurement of mass variations in yarns
Sweating Guarded Hotplate	Measurement of thermal properties and water vapour resistance under steady state conditions
Atlas Moisture Measurement Tester	Measurement of the dynamic liquid transport properties of knitted and woven fabrics.
KAWABATA Evolution system	Measures the mechanical properties of fabrics like Tensile, Shear, Pure Bending, Compression, Surface friction & Roughness.
Softness Tester	Measures the softness of coated and soft fabrics
Flex Tester	Flex Fatigue

Abrasion Tester	To measure the abrasion resistance
Oxygen and Water Vapour TransmissionRate Tester	To measure the Oxygen and Water Vapour Transmission Rate in Plastic Films or Packaging Material
Coefficient of Friction Tester	Study Coefficient of Friction properties on • Plastic Film • And Packaging • Material
Spectroflurophotometer	To measure fluorescence properties
Scratch Tester- 551	To measure the Scratch resistance of the fabric
AFM	High Resolution Surface Imaging
Physical Vapour Deposition	to deposit thin films for coating polymer or fabric substrate with metal particles
RF sealing machine	For making soles of shoes
Thermal and electrical conductivity measurement machine	To measure thermal & electrical conductivity
Electrospinning system	To make nano fibres
Compression Moulding Machine	Molding rubber, plastic, composites they can be used for wide variety of functions as bonding, laminating, assembling etc.
Thermal and electrical conductivity measurement machine	To measure thermal & electrical conductivity

List of prototype development machines under procurement

Name of the machinery	**Specific purpose**
40/60 inch high speed flat carding machine	For individualization of fibers & sliver preparation
Draw frame / Gill Box	Drafting and blending/ doubling
Comber	Removal of short fibers
Needle punching	Sports composites
Roving frame	Preparatory to spinning
Ring frame	Spinning yarn
Winding machine	For winding plied yarns
Filter cartridge winding machine	For winding filter cartridge yarn
TFO / Cabler	Ply twisting
Sectional warping machine	For warping the yarns
Rapier weaving machine	Fabric formation
Warp knitting machine	For knitting technical fabrics
Hose knitting machine	For knitting sports/ industrial hose pipes
Circular knitting machine	For knitting sports/ industrial hose pipes
Braiding machine	To braid the engineered yarns
Vacuum spraying machine	For spraying special chemicals
Industrial sewing machine	For sewing industrial fabrics
Ultra Sonic Sealing Machine	Applied to the non-pin seam of fabrics, non-woven fabrics, thermo-melt fabrics
Shoe stitching	For stitching of Shoe
Sweating Thermal Mannequin	Diagnostic investigation under controlled conditions by simulating human body skin responses to the wearing of textile apparel.
RF sealing machine	For making soles of shoes
Coating Machine	For coating & special finishes
Stenter	For heat setting the technical fabrics

Standards to be procured for Sports textiles

DIN Standards	ONORM EN- 4416		IS- 2150: 1989
	ONORM EN 12801		IS- 6590:1972
	ONORM EN – 12800		IS- 4375:1975
	ONORM EN 12491	Indian standards	IS-14358:1996
	ONORM EN – 12745		IS-2965:1987
	DIN-EN-12222		IS-2970-1987
	DIN -EN- 15330-1		IS-3449-1984
	DIN-EN-135838-3		IS-4726-1984
	DIN-EN-13538-2		IS-14564-1998
	DIN-EN-13537		IS-8991-1978
	DIN EN 926-1		IS-76091988
	AS- 4693.8		IS-3345-1989
AS standards	AS-4693.5		IS-3800-1983
	AS-2001.2.34		IS-3874-1987
	ASTM-F- 2568-06		IS-8404(PART-2)-1979
	ASTM-F-1955-99		
ASTM standards	ASTM-F-1720-06		ISO 22652
	ASTM-F-1932-98	ISO standards	ISO/TR – 20572
	ASTM-F-1853-03		ISO -20866
	ASTM F 1015-03		ISO-22774
	ASTM- F-1551-03		ISO-18454
	ASTM- D- 737-04		ISO/TR-20883
	ASTM-D 4723-07		ISO 22652

R&D Projects on Technical Textiles Undertaken/Under Progress

Projects Completed / Under Progress in T.T. & Sportech

Sr. No.	PRODUCTS
1	Highly engineered friction spun yarns for brake liners & clutch facing suitable for light weight to heavy weight vehicles.
2	Composite yarns made of glass, kynol and carbon fibers for belt cloth for mines.
3	Non asbestos multi component Heterogeneous yarns used in friction component for industry.
4	Filter cartridges made of cotton, PP, Polyester, Glass & Nylon for water and chemical filtrations
5	Multi layered fabrics (high tensile fabrics) for belting
6	Endless belts (conveyer belts) for carrying high tensile loads
7	Non asbestos abrasive yarns for braids used as insulating material in lifting pumps.
8	Kevlar/basofil bi-component yarns for protective fire fighting suits.
9	100% carbon woven fabrics for high heat resistance applications upto 1200° C.
10	Thermal fabrics for protection against cold weather.
11	Kevlar and FR viscose yarns for high altitude pilot suits.
12	Heavy duty fabrics for hand gloves
13	Flame retardant yarns and fabrics made of wool and kanecaron (modacrylic fibers).
14	Heat resistant fabrics for fire curtains made of ceramic/ glass/ metal wire.

Information Center

The Information Center at COE on Sportech has initiated action to procure the following books and standards to enable information access to the industry stakeholders

Books

Name of the Books	Year of publication	Name of the publisher
Wellington Sears Handbook of Industrial Textiles	2000	Publisher Technomic publishing company Inc.
Polymer Enhancement of Technical Textiles	2003	Ismithers
Smart Fibers, fabrics, and clothing: Fundamentals and applications	2001	----do----
Thermal and moisture transfer in fibrous materials	2006	----do----
Conductive Polymers and Plastics	1999	Chemtec Publishing
Database of Ant blocking, Release, and Slip Additives	2005	Chemtec Publishing
Developments in the European Injection Moulding Industry	1995	Chemtec Publishing
Handbook of Antistatics	2007	Chemtec Publishing
Advanced textile conference proceedings (2008)	2008	IFAI Headquarters
Synthetic fibres: nylon, polyester, acrylic, polyolefin	2008	Woodhead Publishing Ltd
Handbook of fibre rope technology	2007	Woodhead Publishing Ltd
Handbook of yarn production	2003	Woodhead Publishing Ltd
Coated and laminated textiles	2005	Woodhead Publishing Ltd
Hand book of technical textiles	2000	Woodhead Publishing Ltd
Smart fibres, fabrics and clothing	2003	Woodhead Publishing Ltd
Textiles in automotive engineering		Woodhead Publishing Ltd
The Fifth International Symposium on "How to Enter Technical Textiles Markets - positioning your company for the recovery"	2009	International news letter
Materials in Sports Equipment (Volume 1 & 2)	July 2003	Woodhead Publishing Ltd
Textiles in sport	August 2005	Woodhead Publishing Ltd
The Physics of sports	2000	Head Publishing, Springer (India) Private Limited
Biomedical engineering principles in sports	2004	---do---
Sport Aerodynamics	2009	-----do-----
Effect of mechanical and physical properties on fabric hand	2005	Woodhead Publishing India
Smart Fibers, fabrics, and clothing: Fundamentals and applications	2001	----do----
Smart clothes and wearable technology	2009	-----do----
Thermal and moisture transfer in fibrous materials	2006	----do----

15	Itch proof woollens for various use including sportech by using Plasma and enzyme treatment
16	Wool Based flame retardant fabrics
17	Synthesis of Moth Resist Dyes for woollen products including sportech
18	To develop a smart indigenous sleeping bag with heating property
19	Design and development of High Performance, Multifunctional, Protective Sportswear for various sports
20	Development of Waterproof Breathable Sportswear with desired functional properties by eco-friendly water based coating techniques
21	Development of thermal responsive high altitude multilayer protective clothing made principally of angora fiber

Note: Sportech Projects -Projects at Sr. No.7to13,15to21 belong to SPORTECH Sector of T.T.

Training activities

WRA conducts several need based training programs at WRA or at site of the organization regarding textile testing, manufacturing technology and emerging technologies. Sportech COE will also actively engage in training of students, faculty members of academic institutions and technicians from the industry to create awareness and knowledge about the technical textiles field as a whole. Short term courses shall be offered round the year to suit the requirements of the industry.

Foreign Collaboration details

WRA's COE on Sportech is in the process of selection of leading international institutions regarding technical consultancy. The institutions are:

1. North Carolina State University
2. RMIT University, Melbourne, Australia
3. Trigon UK

Sportech Prototypes to be developed

Generally, prototypes in COE will be those items for which facilities are either restricted or not available in the county. Besides, the product so developed should have a high value realization. Such Sportech items will be:

- Parachute Canopy Fabrics for sports
- Ballooning Fabric
- Sail Cloth
- Sleeping Bags for adventure sports
- Sports nets
- Tents / Shelters for adventure sports
- Artificial Turfs
- Sportswear

Consortium

1. Wool Research Association (WRA), Thane	: Lead Partner
2. Veermata Jeejabai Technological Institute (VJTI), Mumbai	: Knowledge Partner
3. Kusumgar Corporates, Mumbai	: Expertise Partner

Industry Partners

(To support, technically & financially sustainability of COE)

1. Raymonds Ltd
2. Grentex & Co. Pvt. Ltd
3. Banswara Syntex
4. Shri Ram Textile Mills

Other Support

(For conducting Seminars, Workshop, etc)

1. Textile Association of India
2. Technical Textile Association

Contact Details

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