



INTERNATIONAL JOURNAL FOR ENGINEERING APPLICATIONS AND TECHNOLOGY

TECHNICAL TEXTILE & ITS APPLICATION - A REVIEW

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Abstract

Technical textile is the development in textile manufacturing in which the textile products manufactured primarily for their technical and performance properties rather than their aesthetic or decorative characteristic. It is a large and growing sector and supports a vast array of other industries. Technical Textile are welfare textiles used for their diverse and malfunctioned properties. Technical textile sector is a knowledge based research oriented industry and has been slowly but steadily gaining ground due to functional requirement due to facts such as health and safety, cost effectiveness, durability, high strength, light weight, versatility, customization, user friendliness, eco friendliness et. Technical textile product manufactured are ranging from disposable to long time durable. In this review study we focused on different technical application and market potential of the technical textile.

Keywords: Textile, Technical textile, durability.

1. Introduction

The definition of Technical Textiles adopted by the authoritative Textile Terms and Definitions, published by the Textile Institute, is 'Textile materials and products manufactured primarily for their technical and performance properties rather than their aesthetic or decorative characteristics'. For many years, the term 'industrial textiles' was widely used to encompass all textile products other than those intended for apparel, household and furnishing end uses.^[1]

Textile industry is normally considered as an industry which fulfills the demand like climate protection, increase in the aesthetic sense, over and all apparel need & this sector is then well known as traditional textile or general textile. On the other hand, due to human demand, textile has been molded with new technology for specific use such as human protection from extreme situation etc. & this sector has been given many names but the most common are technical textile, industrial textile, and functional textile. So basically textile can be classified into two main sectors according to its application & they are -Traditional textile and Technical textile.^[2]

The global growth rate of technical textile is about 4% per year which is greater than the growth of home and apparel textile, which are growing at rate of 1% per year.^[3]

Technical textiles can be divided into many categories, depending on their end use. The classification system developed by Technical textile, Messe Frankfurt Exhibition GmbH, is widely used in Europe, North America and Asia. Techtexil specifies 12 application areas: Buildtech, Geotech, Mobitech, Hometech, Agrotech, Clothtech, Indutech, Medtech, Oekotech, Packtech, Protech, and Sporttech. These are sometimes

spelled Agrotex, Buildtex, Mobiltex, Clothtex, Hometex, Indutex, Geotex, Medtex, Oekotex, Packtex, Protex and Sportex.

1.1 Raw material for technical textile:

Natural fibers are the umbrella term for all textile fibers and fiber materials processed from plant or animal origin. They have to be differentiated from man-made fibers, which are produced synthetically. Regenerated fibers, such as bamboo viscose are not classed with natural fibers.

Natural fibers are classified into two main groups: organic and inorganic fibers. Organic fibers are subdivided into plant fibers, such as cotton, jute, hemp, sisal and kapok, and animal fibers, such as wool or silk. Mineral asbestos fibers are example of inorganic natural fibers. Natural fibers are often limited in their length, with silk fibers being an exception at lengths often exceeding several hundreds of meters.

Man-made fibers are industrially produced textile fiber materials. Fiber-forming polymers are macromolecules with relative molecular weight of at least 10,000. More than 1,000 atoms are involved in the formation of a macromolecule. Usually, these polymers originate from the covalent bond of monomers resulting from polycondensation, polyaddition and polymerization reactions.

Man-made fibers from natural polymers: these textile fiber materials can originate from plants, animals or from inorganic sources. Fiber materials made from natural polymers or inorganic origin play a crucial part in lightweight construction applications.^[2]

1. Regular/Generic fibers

- Natural fibers: Cotton, silk, wool, jute, hemp, ramie, flax
- Regenerated fibers: Viscose, Lyocell.

- Synthetic fibers: Nylon, PET, PP, Acrylic
- 2. Specialty variants of regular/generic fibers
 - Flame retardant
 - Super absorbent
 - Anti-bacterial
 - Ultra-fine fibers. etc.
- 3. High tech/high performance fibers:
 - High chemical and combustion-resistant organic fibres: Kevlar, Nomex
 - High performance inorganic fibres: Glass, Asbestos, Carbon

1.2 Manufacturing of Technical Textiles:

Fig-1 and fig-2 summarizes the processes employed in the manufacture of technical textiles. Apart from the use of plaiting and knotting for the manufacture of ropes and nets, weaving was, for many years, the pre-eminent technology employed in the manufacture of ‘industrial’ textiles. In terms of the total weight of textiles produced, weaving still plays a leading role.

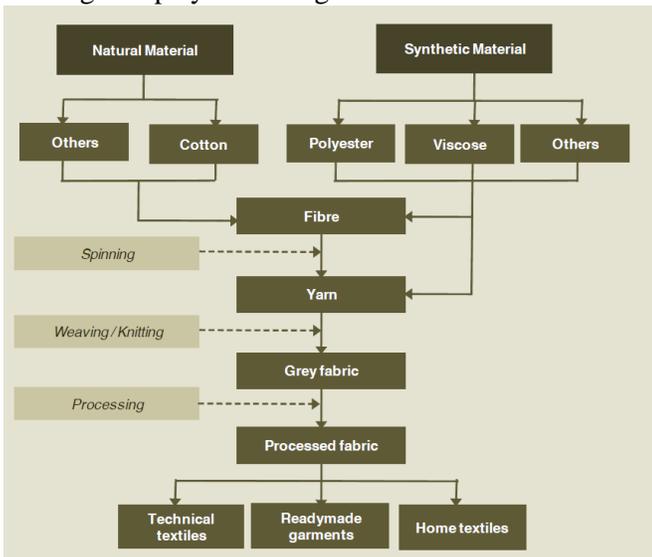


Fig-1: Woven/Knitted Technical Textiles Manufacturing process

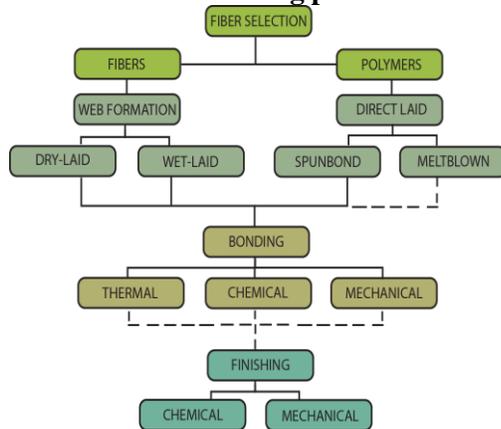


Fig-2: Nonwoven Technical Textiles Manufacturing process

2. Applications of Technical Textile:

2.1 AGROTECH

Agricultural textiles are one of the widening technical textile groups that also known as Agrotech or Agro textiles. In detailed definition agriculture textiles are used for crop protection, fertilization, horticulture and forestry. Agro textile products can be classified as: Landscape fabric that is used for Wind protection and weed control.^[3,4,5,8,9]

Agro textile products are most commonly produced using man-made fibers due to their high strength, durability and other suitable properties. Natural fibers are also used in the sector in less amount of share because of their biodegradable properties. Most commonly preferred manmade fibers are nylon, polyester, polyethylene, polyolefin, and polypropylene; and natural fibers are jute, wool, coir, flax, and hemp. Whereas the natural fibers provides the advantages of high moisture retention and wet strength.^[4,5,6]

The technical textile products covered by Agrotex are: Bird protection net, Capillary matting ,Fishing net, Harvesting net, Insect meshes etc.^[6,7]

Advantage of Agrotex:

1. Decrease the requirement of fertilizers, water and harmful pesticides.
2. Render a healthy farming culture, -an eco-friendly technique.
3. Prevention of the soil from drying out.
4. Increase crop yield, -thermal protection.
5. Prevention of staining and improved uniformity of colour.
6. Protection from climatic changes and its effect.

2.2 BUILDTECH

Textiles are employed different ways in the construction of buildings, the permanent and temporary purpose, dams, bridges, tunnels and roads etc. Temporary structures such as tents, marquees and awnings are some of the most visible applications of textiles. Architectural membrane has risen to prominence in the construction of semi-permanent structures, such as sports stadia, exhibition centres and the other modern buildings. Other products include hoardings & cotton canvas tarpaulins, HDPE tarpaulins, awnings & canopies, scaffolding nets, wall coverings etc.^[3,4,5]

Civil engineering and building industry are an integral part of the development of human society as they involve the planning, design, building, operation infrastructure. These textiles play an important role in the modernization of infrastructure. Buildtech segment comprises of textiles materials used in the construction of permanent and temporary buildings as well as structures. Textiles are used in construction for concrete reinforcement, insulations, proofing materials, interior construction, air conditioning, noise prevention, protection, visual protection, protection against the sun building safety.^[6,7]

Futures of Buildtech:

- They utilize ecologically grown fibres.
- They are processed with less damaging.
- The fabric are of good quality and long lasting

2.3 CLOTHTECH

The Clothtech segment of technical textiles includes fibres, yarns and textiles used as a technical component in the manufacturing of clothing such as sewing threads, interlinings and insulation; it does not include the main outer and lining fabrics of garments, nor does it cover protective clothing. The major problem faced by established manufacturers is the relocation of garment manufacturing to lower cost countries and therefore the need to develop extended of supply lines and marketing channels to these areas, usually in the face of growing local competition.

The Products covered by Clothtech are: Interlinings, Nonwoven interlining fabric, Zip fasteners, Elastic narrow fabric, Hook and loop tape fastener, Sewing threads.^[4,5,6,7]

2.4 GEOTECH

Geotextiles allow the building of railway and road cuttings, reducing the land required and disturbance to the local environment. Geotech segment comprises of technical textile products used in Geotechnical applications pertaining to soil, rock, earth etc. This class of product is called as Geotextiles. Geotextiles particularly refers to permeable fabric or synthetic material, woven or non-woven, which can be used with geotechnical engineering material.^[3,5]

The principal functions performed by Geotextiles are Confinement /separation, Reinforcement, Filtration and drainage, and Protection.

Application areas include Civil Engineering are: Roads, pavements and Tunnels; Slope stabilization and embankment protection; Rail-track bed stabilization; Ground stabilization and drainage; Marine engineering and; Environmental engineering.

Other specialized Geotech products comprise: Geogrids, Geonets, Geomembranes, Geocomposites.

2.5 HOMETECH

The Hometech segment of technical textiles comprises the textile components used in household applications. These products range from blinds used in houses to filter products used in vacuum cleaners, and are also important components in fibre-fills in mattress and pillows.^[3,4,5]

The technical textile products covered by Hometech are: Carpets and furniture backing cloth, Nonwoven wipes, Filter cloth for vacuum cleaners, Mosquito nets, Mattress and pillow components, Stuff toys. Recent developments in the home furnishings industry include the creation of nonwovens that kill dust mites in bedding, repel dirt, and contain antimicrobial qualities.^[7]

2.6 INDUTECH

Indutech includes textiles used directly in industrial processes or incorporated into industrial products such as filters, conveyor belts and abrasive belts, as well as reinforcements for printed circuit boards, seals and other industrial equipment.

The technical textile products covered under Indutech are: Bolting cloth, Drive belts, Composites, Decatising cloth, AGM glass battery separators, Ropes & cordages, Printed circuit boards, Paper making fabrics, Filtration Products.^[4,6,7]

2.7 MEDITECH

Meditech products include textile material used in health, hygiene and personal care, as well as in different implants, vascular prostheses, heart valves, ligaments. Meditech products are available in woven, knitted and non-woven forms based on the area of application. One important change in the textile dedicated to medical applications and especially in the implanted devices is the nano-layer coating that can be found currently.^[4,6,7]

The products covered under Meditech are: Baby diapers, Sanitary napkins, Surgical disposable, Surgical sutures, Surgical dressing material, Artificial vascular graft.^[5]

Advantage of meditech technical textile

- It has excellent antimicrobial properties.
- It has heals repairing ability.
- Light weight and high strength product.

2.8 MOBITEC

Automotive applications represent the largest single end-use area for technical textiles. Mobitech products can be broadly classified into two categories: visible components and concealed components. Visible components include, carpets, headliners, seat upholstery etc. Concealed components include Noise Vibration and Harness (NVH) components, civil and military aircraft bodies, composite reinforcements for automotive bodies, tyre cords, liners wings and engine components, etc.

The technical textile products covered under Mobitech are: Seat covers, Car carpets, Air bags, Drive belt, Tyre cord, Seat belts, Composite panels.^[5,6]

2.9 OEKOTECH

Oekotech stands for new ideas and interesting concepts using Technical Textiles for waste disposal, environmental protection, and recycling. It overlaps with several other areas, including industrial textiles, agricultural and geotextiles textiles. The products under Oekotech segment can include geosynthetic clay liners from Geotech segment, Geomembranes, air and water filters from Indutech segment etc.^[4,5,7]

The technical textile products covered under Oekotech are: House wrap, Pit linings, Erosion control, woven filters, Nonwoven dust filter.

2.10 PACKTECH

One of the important uses of textiles is the manufacturing of sacks and bags traditionally from flax,

cotton, and jute but increasingly from polypropylene. Products covered under Packtech range from polymer-based bags used for industrial packing to jute fibre-based sacks used for packaging food grains and packaging used for tea. This packaging is also referred to as flexible packaging materials. Products include Polyolefin Woven Sacks, FIBC, Leno bags, wrapping fabric, Jute Hessian and Sacks, Soft luggage products etc.^[3,5]

To ensure scratch free and safe handling of sensitive articles Textile partitioned packages are an ideal option. These packages are very useful in automotive industry for transportation and handling of sensitive components like lamp assemblies, fenders etc.^[10]

The technical textile products covered under Packtech are: Flexible intermediate bulk container, Laundry bags, Tea bags, Netting, Woven packaging.^[4,6,7]

2.11 PROTECH

Protective Textiles are textile products and related materials used in the manufacture of protective clothing for personnel working in hazardous environments. Protective clothing includes garments for protection from harmful chemical environment, low visibility, extreme temperature environments, ballistics, and protection from other types of severe impact hazards.

The technical textile products covered under Protech are: Chemical coated fire retardant fabrics, Inherent fire retardant fabrics, Bullet proof jackets, Radiation protection textiles, Flame retardant apparel, High-visibility clothing, Chemical protection clothing, High-altitude clothing.^[4,6,7]

2.12 SPORTTECH

Textiles used in the sports and leisure industries have diverse applications ranging from artificial tuft used in sports surfaces to advanced carbon fibre composites for racquet frames, cycle frames and golf clubs. Other

highly visible uses are balloon fabrics, paraglide and sailcloth fabric. Growth rates are well above average and unit values are often very high. The sports sector is receptive to innovation and developers of new fibres, fabrics and coatings.^[6,7]

The technical textile products covered under Sporttech are: Sports composites, Ballooning fabrics and Sleeping bags, Sport nets Shoe components manufacturers, Tent fabrics and Parachute fabrics, Boat covers, Ropes and Nets, Balls, Air sport fabrics.^[4,5]

CONCLUSION

The technical textile development in the present period is seems to be aggressive and benefit will be realized soon. The integration and the application off the textile with the other field like chemical, electronics, medical and environment shows the path for the progress of technical textile. Technical textile due to its unique features, low cost, durability will grow rapidly in future.

REFERENCES

- [1] A. R. Horrocks & S. C. Anand, "Handbook of technical textile".
- [2] http://en.wikipedia.org/wiki/Technical_textile&grqid=96806iwo&hl.
- [3] www.technicaltextile.net
- [4] www.technicaltextile.gov.in
- [5] www.ittaindia.org
- [6] www.technotex.gov.in
- [7] www.amann.com/en/application/technotex
- [8] Sema PALAMUTCU, "Technical textile for Agricultural application", IJRSR, vol3, July 2017, p1-8.
- [9] Mr. Sunil Agrawal, "Application of textile in agriculture", IJARSE, vol no2, July 2013, p9-1.
- [10] Textile learner. blogpost.in/2013/01/Packtech-textile-.html.