



A Monthly e Magazine
ISSN:2583-2212
June 2024 Vol.4(6), 2296-2300

Review Article

Technical textiles: a review

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<https://doi.org/10.5281/zenodo.12597259>

Abstract

Technical textiles are an important part of our day to day lives which are substituting common materials due to their specific advantages. The global technical textile market was valued at \$191.7 billion in 2022 and is projected to reach \$331.8 billion by 2032, growing at a CAGR of 5.7% from 2023 to 2032. United States of America is the world's largest producer and consumer of technical textiles having 23% share followed by Western Europe having 22% share, China having 13% share, Japan having 7% share and India forms only 3% of the total world consumption. Medical textiles currently show a rapid growth and are expected to be the most up and coming area of research and application.

Keywords: Technical, Textile, India, Industrial, Functional, Electronic and Photonic

Textile industry is generally recognized as an industry fulfilling clothing requirements of human beings for protection, grace and improves aesthetic sense. This sector is called as traditional textile or general textile but its uses do not remain limited to this anymore. The wings of Textiles industry have been spread out to more specific and scientific applications. This sector has been variously named but the most commonly are technical textile, industrial textile, and functional textile. Presently, we may classify the textile into two main sectors based on its usage; traditional textile and technical textile. Traditional textile meets the general demands of human being that covers clothing, made ups, bead wears, etc. whereas, technical textile is a product made to attain a particular and technical requirement; water proof jackets, filters, fire proof seats etc. It reveals that nonwoven technique for making fabric lived along with weaving technology and played an important role in developing technical textile

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(Chaudhary and Shahid, 2012). Technical textile is now considered as multi-disciplinary field with many ends uses applications. Depending on the product specification and end uses applications, the technical textile products have been broadly classified into twelve segments:

Agrotech (Agriculture, horticulture and forestry)

Buildtech (building and construction)

Clothtech (technical components of shoes and clothing)

Geotech (geotextiles, civil engineering)

Homotech (components of furniture, household textiles and floor coverings)

Indutech (filtration, cleaning and other industrial usage)

Meditech (hygiene and medical)

Mobiltech (automobiles, shipping, railways and aerospace)

Oekotech (environmental protection)

Packtech (packaging)

Protech (personal and property protection)

Sportech (sport and leisure)

The industry has been gaining momentum at a fast rate. The production and demand of industrial and technical textile has bright future prospects in comparison to the past. Due to the prevailing situation of hazardous incidents, protection of soldiers during war, fast movement of vehicles, advancement in medical science, security situation, occurrence of extreme situation and terrorist attacks and even threat of nuclear war have also increased the importance of technical textile (Basu *et al.*, 2014).

Present scenario: India is one of the largest producers of textiles and garments. The textile industry in India contributes 14% towards the GDP of USD 1.18 billion. Currently, the consumption of technical textiles in India forms only 3% of the total world consumption; however, it is growing at a rate higher than most developed countries. The reasons for low penetration in this market are several, such as scattered production structure, inadequate research and development and lack of skilled personnel. Another major contributing factor is that there is lack of awareness about the benefits of using technical textiles.

Recent developments: There are electronic textiles, normally known as e-textiles or smart textiles. Examples are sports shoes, wearable computer jackets, warning vests, photonic textiles for innovative lighting solutions, wearable E-health systems, electronic textiles to help battlefield medics, global positioning system (GPS) jackets and breathable artificial fabric.



Current technology:

Zoll Life Vest

The zoll life vest wearable cardio verter defibrillator (WCD) is designed to protect patients at risk of sudden cardiac death (SCD), when a patient's condition is changing and permanent SCD risk has not been established. While some defibrillator devices are implanted under the skin, the Life Vest WCD is worn directly against the patient's skin. It is lightweight and easy to wear, allowing patients to return to most of their daily activities with peace of mind that they have protection from SCD. Life Vest is designed to detect certain life-threatening rapid heart rhythms and automatically deliver a treatment shock to save a patient's life. Life Vest is used for a wide range of patients, including those who have a reduced heart function following a heart attack, before or after bypass surgery or stent placement, or for those with cardiomyopathy or heart failure that places them at particular risk. On any given day, tens of thousands of people around the world have protection from SCD by wearing the Life Vest WCD (Goetz *et al.*, 2023).

Vivo metrics life shirt

The Life Shirt (Vivo metrics, Inc., Ventura, CA, U.S.A.) is a multi-function ambulatory device capable of simultaneously monitoring several physiological signals and patient reports of symptoms and wellbeing (Halin *et al.*, 2005). The Life Shirt system is an extensible data acquisition and processing platform consisting of a garment, a data recorder, and PC-based analysis software. Sensors in the Life Shirt garment continuously monitor respiration, the electrocardiogram, activity and posture. Other functions are easily plugged into the system, including pulse oximetry, EEG/ EOG measurement, blood pressure, temperature, capnometry and acoustic monitoring. Subjective patient data may also be entered into the Life Shirt recorder, and all data are encrypted and written to a flash memory card. Vivologic (TM) analysis software provides full-disclosure analysis and display of high-resolution waveforms and over 30 derived parameters; the software also produces summary reports for clinical diagnostic purposes (Grossman *et al.*, 2004).

Sensatex smart shirt

The sensatex smart shirt incorporates the wearable motherboard smart shirt, a novel electro-optical garment which provides an extremely versatile network for sensing, monitoring and information processing that can enable a wide range of products (Bonato, 2009).

Technical textiles are a knowledge-based research-oriented industry and has been slowly but steadily gaining importance because of the one or more of the reasons such as functional requirement, health



and safety, cost effectiveness, durability, high strength, light weight, versatility, customization, user friendliness, eco-friendliness, logistical convenience, etc (Karahan *et al.*, 2023). Technical Textiles is expected to be a frequently increasing opportunity for developing economies in Asia both from a production perspective as well as consumption opportunities in a technologically evolving economy. Thus, Technical textiles are having significant potential in India and the government has already taken a few steps to promote this industry. The technical textiles industry has extremely large potential in India. The country has emerged as an end-use consumer as well as trader of technical textiles. Neighboring countries like China, Japan, Korea, Taiwan and other developing countries have great potential in industry in the coming decade. The trade for technical textiles will be boosted by the changing economic scenario in these countries. India can emerge as a key player in the technical textiles industry because of its highly skilled and scientific manpower and abundant availability of raw material (Chaudhary and Shahid, 2012).

Initiatives related to technical textile:

Production Linked Incentive (PLI) Scheme for Textiles Sector: It aims to promote the production of high value Man-Made Fiber (MMF) fabrics, garments and technical textiles.

Harmonized System of Nomenclature (HSN) Codes for Technical Textile: In 2019, Government of India dedicated 207 HSN codes to technical textiles to help in monitoring the data of import and export, in providing financial support and other incentives to manufacturers.

100% FDI under Automatic Route: The Government of India allows 100% Foreign Direct Investment (FDI) under automatic route. International technical textile manufacturers such as Ahlstrom, Johnson & Johnson etc have already initiated operations in India.

Technotex India: It is a flagship event organized by the Ministry of Textiles, in collaboration with **Federation of Indian Chambers of Commerce & Industry (FICCI)** and comprises exhibitions, conferences and seminars with participation of stakeholders from across the global technical textile value chain.

Amended Technology Upgradation Fund Scheme: To improve exports and indirectly promote investments in textile machinery.

Future Technology: Wireless transmitters that can collect data even outside Bluetooth areas, integration of other fabric materials that could help improve versatility, smart textiles for children and automatic calibrations.

Conclusion

The market size of Indian technical textiles industry was 22 billion dollars in 2022 and is



estimated to reach 309 billion US dollars in 2047. Technical textiles have both import and export potentials and is one of the fastest growing segments of the Indian economy.

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