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Technical Textiles in Automotive Applications

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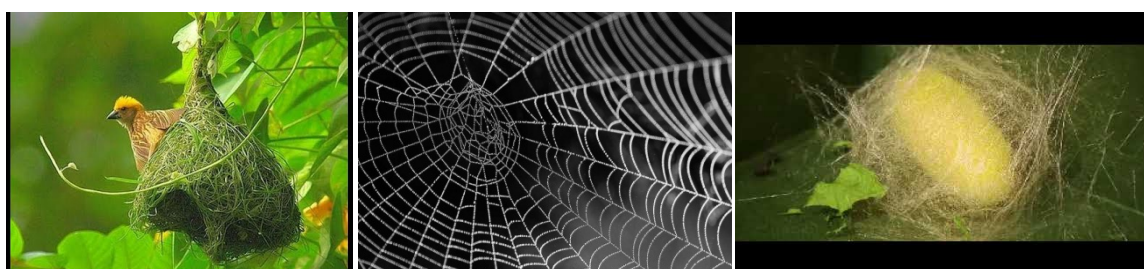
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ABSTRACT: Mankind knows textiles by generations. On a broad outlook, it appears that textiles have no application other than apparel purpose. But as a matter of fact, there are non apparel uses of textiles such as technical applications and automotive textile is an integral part of technical textile. The present study is conducted with the aim to enlighten people about the important textiles used in automotive applications and their functions. Automotive textiles is that part of textiles which is used in accordance with the vehicles i.e. It is widely used in automotive industry from light weight vehicles to a heavy truck or duty vehicles.

KEYWORDS: Conventional, traditional, technical, automotive.

I. INTRODUCTION

Food, Shelter and cloth are three basic needs of mankind. Mankind knows textiles by generations. On a broad outlook, it is considered that textiles have no applications other than apparel purposes.



(a)

(b)

(c)

Fig. 1 Non apparel uses of technical textiles (a) Bird's nest (b) Spider web (c) Cocoon.

In fact, there are non-apparel uses of textiles such as technical applications. Even animals, birds and plants prefer the textiles for technical purposes rather than for apparels as shown in fig 1 (a), (b), (c). So basically textile can be classified into two main sectors according to its application & they are –

TRADITIONAL TEXTILE: Conventional textiles are textiles which are manufactured primarily for aesthetic or decorative purposes.

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TECHNICAL TEXTILE:

Technical textiles are manufactured primarily for performance or function rather than aesthetics. 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.

According to the Textile Institute, 'Textile materials and products manufactured primarily for their technical and performance properties rather than aesthetic and decorative characteristics are called as Technical textiles. Technical textiles are reported to be the fastest growing sector of the textile industrial sector. A technical textile is a textile that has been developed to meet the exacting specified high-performance requirements of a particular end-use other than conventional clothing and furnishings.

❖ BROAD CLASSIFICATION OF TECHNICAL TEXTILES IS AS FOLLOWS:

	Agrotech Horticulture + landscape gardening, agriculture + forestry, animal keeping		Meditech Hygiene, medicine
	Buildtech Membrane, lightweight + massive construction, engineering + industrial building.		Mobiltech Cars, ships, aircraft, trains, space travel
	Clothtech Garments, shoes		Oekotech Environmental protection, recycling, waste disposal
	Geotech Road infrastructure, Railways, Irrigation and Hydraulic structures, Waste Landfills, Dams etc.		Packtech Packaging, protective-cover systems, sacks, big bags, container systems
	Homotech Furniture, upholstery + interior furnishing, rugs, floor coverings		Protech Person and property protection
	Indutech Filtration, cleaning, mechanical engineering, chemical industry		Sporttech Sport and leisure, active wear, outdoor, sport articles.

(a)

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(b)

Fig 2(a) indicates broad classification of technical textiles in 12 segments. As shown in fig 2(b), there are various applications of technical textiles and so there is a huge scope in the field of technical textiles and the demand for these will increase day by day.

❖ DEMAND FOR TECHNICAL TEXTILES:

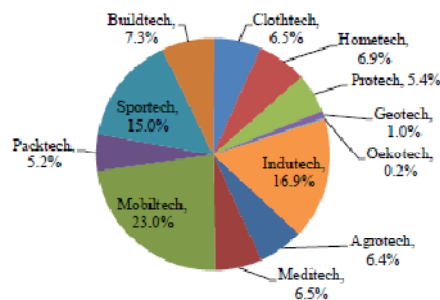


Fig .3 Demand for technical textiles

Technical textile is the fastest growing segment of textiles in India. As shown in fig. 3, one can understand the percentage demand for various branches of technical textiles.

II. RELATED WORK

Mankind [1] knows textiles by generations. On a broad outlook it appears that textiles have no application other than apparel purposes. But as a matter of fact, there are non-apparel uses of textiles such as technical applications. Shivendra Parmar et al have studied on applications of textiles in automobile and concluded that textile materials are used in automobiles for interior trim and for ensuring comfort (e.g. seat covers, carpets, roof liners, and door liners) as well as for reinforcement (e.g. tyre) and filters. Textiles also offer weight reduction which in turn results in fuel economy. Airbags help to save lives, but at times they can also be a source of serious injury. The search for a uniform smart airbag, which can perceive the size of the passenger or whether the seat is empty and react in that

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manner, is in progress. In addition, incorporated safety devices associated with the seat belt along with other safety items, particularly for child passengers, are under development. There is also a technical challenge of producing the bag by using more rational techniques and related specifications made by the automotive industry.

William C. Smith [2] in his paper on Nonwovens in Automotives- more than just a pretty face researched that the automotive industry is one of the largest users of "engineered" nonwovens. New materials, usage techniques, and applications are growing extensively due to cost and performance. This has been just a brief look at the many areas where nonwovens are used in automotives. He concluded that, the largest volume and value area, nonwovens play vital roles in many other and technical areas. Nonwoven usage is growing in automotives and there are various driving forces for growth.

Automobile seat belt fabric is one of the decorative materials in automobile textile fabrics. Guifen Yao[3] concluded that fabric should have soft handle, good air permeability, coordinate color, luxury and generous pattern, wear resistance, anti-fouling, flame retardant, certain friction factor, and antistatic property. Polyester fibre is used as major raw materials for use in seat belt fabric.

Hartmust Presting [4] presented an overview about existing nanotechnologies in car, applications with short term and medium term potential as well as long term applications such as light weight construction using nano carbon nanotubes have a high potential which can be used in automotive bodies. In the automotive industry, nanotechnology applications are manifold. They reach from power train, light weight construction, pollution sensing and reduction, interior cooling, wear reduction, driving dynamics, surveillance control, up to recycle potential and much more.

III. MOBILETECH

(TEXTILES USED IN TRANSPORT; AUTOMOTIVE AND AEROSPACE)

Mobiltech are technical textiles used in automotive or transport sector. It includes applications in automotive and automotive components (including aircrafts and railways). Mobiltech covers not only isolation and safety aspect but also focuses on comfort and style.

Mobiltech products can be broadly classified into two categories: visible components and concealed components. Visible components include seat upholstery, carpets, seat belts, headliners, etc. Concealed components include Noise Vibration and Harness (NVH) components, tyre cords, liners, composite reinforcements for automotive bodies, civil and military aircraft bodies, wings and engine components, etc.

The demand for majority of Mobiltech products is dependent on the growth of both passenger cars and commercial vehicles segments. Over the years, the Indian automobile industry has emerged as one of the world's largest sector. Technical textiles that are used in the automotive or transport sector are called "Mobiltech".

- **AUTOMOTIVE TEXTILES:**

Textiles which are used in vehicles are called as automotive textiles. It is used in light weight vehicles to heavy duty vehicles. Automobile is the lifeline of present society, trade, industry and commercial activity is extremely dependant on this sector. Therefore, it is no exception that tremendous growth and development is taking place in this sector. This automotive consumes a lot of textile materials that may be visible or concealed in automobile.

- **GROWTH OF AUTOMOBILE TEXTILES:**

Improvement in the standard of living of people which leads to greater demand for personal vehicles.

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Textile Materials used in Car Interiors

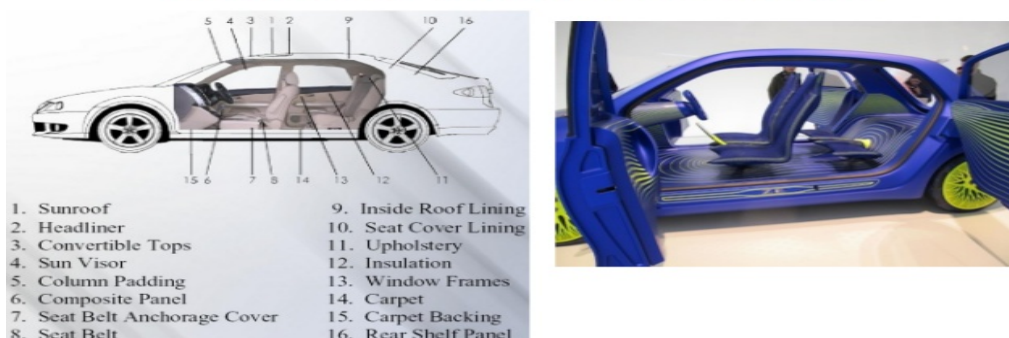


Fig.4 Textiles in car interiors

A car interiors becoming more important as people are spending more times in cars. For better fuel economy, lightweight vehicles which are replacing metal by fibre composites in most of the applications. Fig. 4 indicates the use of textiles in car interiors.

• TEXTILES IN AVERAGE MODERN CAR:

Sr. No.	Uses	Percentage
1	Carpets	33
2	Upholstery	18
3	Pre assembled interior components	14
4	Tyres	12
5	Safety belts	8
6	Airbags	3.7
7	others	9.4
Total		100

Table 1

Table 1 indicates percentage amount of use of technical textiles in modern car.

• FUNCTIONS OF AUTOMOTIVE TEXTILES:

- Comfort
 - Warm and soft feel of seats
 - Flexible seats
 - Moist and odour resistant interior
- 1) Decorative
 - Better interior
 - Carpets

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- 2) Safety purpose
 - Seat belts
 - Air bags
- 3) Functional
 - Noise control
 - Filters
 - Battery separators

IV. TEXTILES USED IN AUTOMOTIVE APPLICATIONS

• **HELMET:**

The principal function of helmet is to absorb the shock of a crash and thus put a stop to major injury to the brain rather than preventing head and face crack.



Fig .5 Textiles used in Helmet

• **SEAT BELTS:**

A seat belt is a vehicle safety device designed to secure the occupant of a vehicle against harmful movement that may result during a collision or a sudden stop.



Fig .6 Textiles used in seat belt

A seat belt functions to reduce the likelihood of death or serious injury in a traffic collision by reducing the force of secondary impacts with interior strike hazards, by keeping occupants positioned correctly for maximum effectiveness of the airbag (if equipped) and by preventing occupants being ejected from the vehicle in a crash or if the vehicle rolls over. Fig. 6 shows textile used in Seat belt applications.

• **INTERIOR CARPETS:**

Vehicle mats, also known as "automobile floor mats, are designed to protect a vehicle's floor from dirt, wear, and salt corrosion.

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Fig .7 Textiles used in interior carpets

One major use of a vehicle mat is to keep the car looking clean. Fig. 7 shows Textile used in Interior carpets.

- **SUNVISORS:**

The sun visor is located on the inner ceiling above the front seats in the driving compartment of the car.



Fig .8 Textiles used in sunvisors

Fig 8 indicates Textiles also can be used as Sunvisors. The function of the sun visor is to increase visibility by protecting the driver from light that can disturb the driving, regardless of where the light is coming from.

- **CAR BODY COVERS:**

A car body cover is not a luxury, but a necessity. It is of great importance to those car owners who do not have a dedicated covered space to park. Body covers are very essential for overall protection of the car.



Fig .9 Textiles used in car body covers

Some of its important functions are to protect the car against weather, scrapes, scratches, and sun damage and also to protect against sun damage to paint and leather. To protect the car technical textile use as car body cover as shown in fig 9 plays a major role.

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- **AIR BAGS**

It consists of the airbag cushion, a flexible fabric bag, inflation module and impact sensor.



Fig .10 Textiles used in air bags

Fig. 10 indicates the lady with air bag for safety purpose. The purpose of the airbag is to provide the occupants a soft cushioning and restraint during a crash event. It can reduce injuries between the flailing occupant and the interior of the vehicle.

- **TYRE CORDS:**

A tyre is a ring-shaped component that surrounds a wheel's rim to transfer a vehicle's load from the axle through the wheel to the ground and to provide traction on the surface traveled over. The belt system's main function is to provide stability to the tyre's tread area, which contributes to wear; handling and traction.



Fig .11 Textiles used in tyre cords

Steel belts provide strength and stability to the tread area without adding a lot of weight to the tyre. Usually two plies of steel cord placed at opposite angles make up the belt system. As shown in fig.11, technical textiles can be used in tyre cord applications.

- **HEADLINERS:**

The headliners are used for both, functional and aesthetic purpose.



Fig .12 Textiles used as headliners

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Fig. 12 indicates Textile used in Headliners. The functional purpose of headliner is to provide insulation, shock absorption and hide the wire run through roof. In addition to functional purpose, the headliners are used to enhance the appearance of the vehicle interior.

V. CONCLUSION

Today, there are many more applications of technical textiles and nonwovens inside the car. The global automotive textiles market is projected to witness high growth on account of the rising automobile production particularly in Asian countries such as India, China, Indonesia, and Thailand. In addition, increasing penetration of technical textiles in the automotive industry to cater to high performance applications is also expected to drive the global demand.

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