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# Scope of nonwoven textile

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**Abstract**
The nonwovens sector has recorded worldwide growth of 7 to 8 per cent in recent years. In Asia, the sector has grown by 10.7 per cent, while in Latin America; it has recorded an 8.5 per cent growth. The sector has grown at 15 per cent in the Middle East. Keeping in mind the large market, it is obvious that the nonwovens sector has a huge scope in India, especially in the quota-free regime. Studies have revealed that the sector will witness the strongest growth in Asia in the coming years. Nonwoven textiles are used for preparing fireproof clothing, shoe components, interlining for garments, surgical pads, medical clothing, diapers, tampons etc. These are also used for preparing building & construction products. There is a tremendous scope for expansion in the nonwovens segment of the textiles industry. Over the last few years, nonwoven has been one of the fastest growing segments of the global textiles industry. However, in India, despite great demand for nonwovens, the sector has largely remained untouched. Only one per cent of the total demand for such material is met from local sources, India is the second largest textile economy in the world after China, but its contribution in the nonwoven textiles market is negligible. The market for nonwovens in India is estimated to be worth Rs 6000 crore, but the actual production of such textiles within the country is just around one per cent. There is an urgent need to promote the production of non-woven textile in India to make the presence in global market.

**Keywords:** Non-woven, textile, cotton

## Introduction
India's textile industry is a conventional industry dominated by cotton. According to a recent report by the Ministry of Textiles, India, there are 1834 textile mills with an installed capacity of 37 million ring spindles, 489,718 rotors and 56,526 looms. Compared to the capacity of the conventional textile industry, the nonwoven roll good production is between 80,000 and 100,000 metric tons. Textiles industry, which includes the nascent technical textiles sector, contributes 4% to the GDP and 14% to the industrial production. The two main reasons which make the Indian textiles industry strong are: 1) export earnings and 2) employment opportunities. India's textiles industry employs some 35 million people directly and contributes 17% to the total export earnings of the country.

Cotton plays a key role in the National economy in terms of generation of direct and indirect employment in the Agricultural and Industrial sectors. Textiles and related exports of which cotton constitutes nearly 65% account for nearly 33% of the total foreign exchange earnings of our country which at present is around 17 billion dollars with a potential for a significant increase in the coming year. Cotton is cultivated in three distinct agro-ecological regions (north, central and south) of the country. The northern zone is almost totally irrigated, while the percentage of irrigated area is much lower in the central and southern zones. The lowest being in the central zone which has nearly 60% of cotton area of our country.

In the recent past, India offered enormous excitement for the US and European technical textiles sector. They all eyed India as an immediate new market offering enormous opportunities. India's growth is expected to be around 8% in the years ahead and should be watched as a growth market. However, the landscape is not mature enough yet for the entire segment of the nonwovens and the technical textiles industry of the developed world to start having tremendous business opportunities.

Nonwoven is a distinct class of fiber-based material with fabric characteristics and useful properties. ASTM defines Nonwoven as; 'A textile structure produced by bonding or interlocking of fibers, or both accomplished by mechanical, chemical, thermal or solvent means and combination of there of'. It can also be defined as 'A fabric made directly from

fibers or from the chemicals from which the fibers themselves are made'. Nonwoven for technical textiles are predominantly synthetic polymer-based because of inherent advantages of strength and versatility of such fibers. Polyester and polyolefin account for almost 50% of the total raw material consumption.
Nonwoven manufacture is usually made by producing a web of fibers, which is then strengthened by various bonding techniques.

**1. Nonwoven Web Formation**
There are various methods of making nonwoven webs:

- **Air laid**: Fibers are opened, suspended by air, and then collected on a moving screen.
- **Wet laid:** A mixture of fibers in water is collected on a screen, then drained and dried.
- **Spun laid:** Hot, continuous synthetic filaments that were just extruded through the spinnerets are blown onto a moving belt where they are bonded together by themselves to a web.

**2. Nonwoven Web Bonding**
Nonwoven web bonding includes: thermal bonding, mechanical bonding, and chemical bonding. The traditional thermal and mechanical bonding techniques include thermal bonding, hydroentanglement, and needle bonding.

**a) Thermal bonding**
Bonding of the nonwoven that contains thermoplastic component(s) by application of heat.

- **Spunlaced or Hydroentanglement:** Bonding by entangling the fibers using very fine jets of high pressure water.
- **Needle bonding:** Entanglement of fibers by a set of barbed needles punching through the web.

**b) Chemical bonding includes wet and dry chemical bonding**
Dry chemical bonding is seldom used because it is difficult to give the composite a uniform strength.

- **Wet chemical bonding:** Conducted by saturating fibrous webs with an adhesive, or by applying an adhesive to the surface of the fibrous webs.
- **Dry chemical bonding:** Contact the fibrous web with particles of dry adhesive material, and heat the composite to a temperature above the sticking point of the adhesive.

**Advantages of nonwovens for technical application**
Nonwovens' resistance to tears, soil, chemical, puncture, UV light exposure, mildew, rot, freeze/thaw conditions, excellent strength, breathability and barrier properties, attractive fiber and structural appearance of various surface tension at relatively low cost makes them an ideal candidate for technical applications.
Fabrics made by nonwovens technology can be made up to five times more durable than conventional textile fabrics of the same weight. They can be designed to be extremely abrasion and heat resistant. Non-wovens have a great deal of development and growth potential.

**Applications of nonwovens in technical textiles**
**Typically, nonwovens in technical applications include**

- **Agrotech:** Crop covers, seed blankets, weed control fabrics, greenhouse shading, root bags, biodegradable plant pots, capillary matting cover, protection and collection, fishing and tying.
- **Buildtech:** Roofing and tile underlay, underslating, thermal and noise insulation, house wrap, facings for plaster board, pipe wrap, concrete moulding layers, foundations and ground stabilization, vertical drainage, protection and display, textile construction, building components, reinforcements and high quality wallpapers4.
- **Clothtech:** Shoe components, insulation and structure, sewing products, interlining, cleanroom garments, and shoe and leather goods applications.
- **Geotech:** Asphalt overlay, soil stabilization, drainage, sedimentation and erosion control, pond liner, impregnation base, drainage channel liners, separation, reinforcement, filtration, offshore land reclamation, road side, rail side, river and canal banks, and reservoirs.
- **Hometech:** Carpet components, furniture components, consumer wipes (baby, personal and household wipes), and industrial wipes (food service, industrial general, industrial specialty, and medical wipes), air and water filtration, interior design, drapes, covers, ticking, and composites.
- **Indutech:** Electrical components (cable instructions, floppy disc liners, insulation tapes and micro filters), filtration and separation (air, liquid and gases), satellite dishes, clothing surfacing tissues/veils, conveyor belts, reinforced plastics, PVC substrates, flame barriers, noise absorbents, battery separators (alkaline, acid and fuel cells), anti-slip matting, lifting and pulling.
- **Medtech:** Drapes and gowns, sterile wrap, swabs (operating room and ward use) and dressing, cleaning, coverstock, wound-care, protective apparel, bedding and sheets and masks.
- **Mobiltech:** Boot liners, parcel shelves, heat shields, shelf trim, molded bonnet liners, boot floor covering, fuel/oil filters, headliners, rear parcel shelves, airbags, cabin air filters, engine intake and exhaust air filters, silencer pads, insulation materials, car covers, under padding, car mats, tapes, backing for tufted carpets, seat covers, door trim and insulation, floor coverings, protection and composites.
- **Packtech:** Bulk packaging with predefined 3D structure, scrap and disposable, spacer and tying and absorbent food pads.
- **Protech:** Chemical and biological protection, particulate protection, flame retardant, cut resistant, shields and gowns worn in emergency response, chemical handling, hazardous waste control, cleaning and filtration.
- **Sport tech:** Luggage components, sports equipment, sportswear, wipes, covers, disposable and camping equipment.
- **Oekotech:** Environmental protection, exhaust air and waste water filtration, dust collection, leak oil absorbent, gas and odor removals.

**Use of Cotton Fibre in Nonwoven Industry**
Fibres of cotton, polyester, polypropylene, viscose and other diverse mixtures are used in medical and hygienic non-woven products. Cotton fibres are utilised as raw materials in up to 20% of the total fibres in production of non-wovens. Cotton fibres are used in and hygiene products because of their high absorption capacity, comfort, softness, chemical resistance and biodegradability. These fibres can be of raw cotton, very clean cotton, recoverable cotton, bleached cotton of high quality, ultra-white cotton, or ultra-white cotton without absorption capacity.
The vegetal impurities of the cotton fibres, and the development of other types of fibres, have reduced the use of cotton in medical and hygiene non-wovens. Specific high-

performance installations must be applied when processing the cotton fibres in order to eliminate impurities. Cotton fibrous webs can be obtained by wet-laid or dry-laid processes, by continuous carding with/without randomising of the fleece or by cross-lapping processes. Bonding of the fibrous webs is made possible by calendering, hydro-entanglement, or needle-punching technologies.

Nowadays there are many non-woven products with natural fibres acceptable to the human body. In addition, many structures (including cotton absorbent media situated between spun-bonded or melt blown non-wovens) have been obtained in order to increase the volume offered on the world market.

The increase in the application of cotton fibres for non-wovens is due, among other factors, to the hydro-entanglement technology that allows not only the bonding of the fibrous web but also to mechanical cleansing of the cotton fibres, thanks to the high pressure of water involved in the process. Other technologies, including modified needle-punching technologies, are also used because of the interest of companies which manufacture non-wovens in discovering their technical limits.

For domestic end-uses, the cotton fibres consist of 60% of all raw materials. The question arises as to why, for non-wovens used as medical and hygiene products, is it impossible to use more natural fibres than synthetic fibres, if the human body finds them more comfortable, and such fibres are safe for the environment.

Major industrial applications include geotextiles, medical textiles, agricultural textiles, sport textiles and protective textiles. Among these industrial applications some of the prominent sectors where nonwoven fabrics find applications include geotextiles, automotive textiles, filtration, medical textiles, and defense and sport textiles.

## Automotive Applications

Automotive Industry is one of the major sectors where nonwovens find technical applications. In every automobile, at least 25 kilograms of nonwovens or approximately 20 square meters of fabric find applications in thirty to forty different components. Common applications include trunk liners, headliners, carpet backings, dashboards, acoustic insulation and absorbent materials. Needle punched fabrics are predominantly used for major applications in automobiles. Thermal bonded and spun laid nonwovens are also used on their own or in different combinations. There is a greater resurgence for natural fiber based nonwovens for automotive applications due to the need for recyclability and light weight high fuel efficient vehicles to cut down greenhouse gas emissions.

The automotive industry is buying into the idea of reducing the weight of automobiles as a small solution to improve the fuel efficiency and help with the global warming issue—this can be achieved using nonwoven composites.

Raw cotton with different binder fibers and combinations with kenaf and flax were tried to develop environmentally benign and moldable composites in binder fibers such as PLA and Bio PET. Results many studies indicated that intimately blended cotton fibers with binder fibers gave better composite. This result shows that cotton can form a good substitute for synthetic fibers. Developing cotton composites from low micronaire cottons can be a best possible solution for developing 100 % recyclable materials for auto industry.

## Medical Applications

Some of the general applications of nonwovens in medical sector include surgical gowns, facemasks, surgical and medical accessories and medical furnishings. Normally, spunbonded nonwoven fabrics are used for medical and surgical gowns. Recently, functionalized nonwovens are finding more applications in medical field. Cotton breathable protective garments that are impermeable to liquids have been developed. Cotton based nonwoven liner that is used next-to-skin with antimicrobial finish is an important component of the garment.

Nonwoven Gauze and Bandages - Wadding, gauze, bandages and similar articles, impregnated or coated with pharmaceutical substances or put up in forms or packing's for retail sale for medical, surgical, dental or veterinary purposes. These items are normally produced with 100% cotton fibres.

**Some cotton nonwoven products**

| Personal Care/Hygiene | Wipes | Medical |
|---|---|---|
| Baby diapers | Industrial wipes | Surgical: disposable caps, gowns, masks and shoe covers |
| Feminine hygiene products | Surgical wipes | Drapes, wraps and packs |
| Adult incontinence products | | Sponges, dressings and wipes |
| Dry and wet wipes | | Bed linens |
| Training pants | | Contamination control gowns |
| Cosmetic removal pads | | Examination gowns |
| Nursing pads | | Transdermal drug delivery |
| Nasal strips | | Shrouds |
| Adhesive for dental plates | | Underpads |
| Disposable underwear | | Procedure packs |
| | | Heat packs |
| | | Ostomy bag liners |
| | | Fixation tapes |
| | | Incubator mattresses |

**Military Applications**

Military applications of nonwovens have been relatively fewer compared to their applications in automobiles and other industrial sectors such as filtration. Nonwoven composites are finding applications in developing multifunctional products that have defense applications such as ballistic proof chest shield.

**Filtration Applications**

The use of nonwovens in filtration is well-known and needs no elaborate discussion. However, more and more nano-fiber based products are finding applications either as standalone filter media or in combination with conventional nonwovens. Important concerns with regard to the application of nano-fibers such as durability and process scale-up are currently being addressed both by academia and industry.

**Conclusion**

Although the world market of nonwoven products continuously grows, it faces the structural readjustment followed by the change of global economic condition, raw material capacity and consumers' needs and behavior. In addition, new expansionary manufacturers are emerging while the existing nonwoven producers are concerned by present consumers. Cotton fiber has potential to increase its market share in different nonwoven target products. Nonwovens where cotton could be used are absorbent and hygienic products, medical/surgical and health care products, personal care products, and wipes. Cotton has the required fiber properties (such as absorbency, ease of handling for end products user, disposability, and sanitation value) to produce these products. It is technically feasible to use cotton in nonwoven textiles, but economic constraints (such as price volatility and processing costs for impurities) impede its use. Cotton's price volatility interferes with firms' ability to plan for the long term, while impurities present in raw cotton fiber places technological constraints on its uses, increasing the cost of production. These issues should be addressed to be able to increase the use of cotton in nonwoven textile.

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