NONWOVENS TECHNOLOGY
A tribute to those so many unnamed freedom fighters who now a days living miserable life.... The Hands, those were so strong to fight against enemies.... now turned into the weak hands of beggars.....

Perhaps this tribute of mine won't be able to add anything new or glorious to their life full of pity & misery but yet our heart rending love & respect shall remain....till the last....
Hi, I am Jahangir Alam Sujon. I am a student of Southeast University (Dept. of Textile Engg.). Fabric Manufacturing Technology is my major Subject. I will work as a Fabric Technologist after completing my B. Sc in Textile Engineering.

Currently I am working as a contributor of Textile Bulletin. I have some experience in Textile Technology. If someone need any Technical Support for Fabric Manufacturing Technology, please don't hesitate to contact with me.

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Editor’s Massage:

Currently I am a student of Southeast University (Dept. of Textile Engineering). My major Subject is Fabric Manufacturing Technology. Accepting challenges is the foundation of my life & I always devote myself in performing my responsibilities. You will find me a totally dynamic, highly motivated & committed individual with pride in being spontaneous and communicative.

We have a small Handicrafts Project. We are producing Non-woven Silk fabric in our “Natural Handicrafts” project. Hare is working a large team of well trained & energetic women. More then 200 women are involved in our project.

Our Nonwoven Fabrics are made from natural silk and jute fibers by artisans working at ‘Natural Handicrafts’ project. Your purchase revives a traditional craft & helps create employment for underprivileged women working in the rural areas of Bangladesh.

For more information Please visit: http://naturalcrafts.org/

If you have any enquiry about nonwoven fabrics, please let me know what is your idea, problem or specific any questions. Please mail to: muttaki@classictex.com
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Nonwovens are defined by ISO standard 9092 and CEN EN 29092. “A nonwoven is a sheet of fibers, continuous filaments, or chopped yarns of any nature or origin, that have been formed into a web by any means, and bonded together by any means, with the exception of weaving or knitting. Felts obtained by wet milling are not nonwovens. Wet laid webs are nonwovens provided they contain a minimum of 50% of man-made fibers or other fibers of non vegetable origin with a length to diameter ratio equals or superior to 300, or a minimum of 30% of man-made fibers with a length to diameter ratio equals or superior to 600, and a maximum apparent density of 0.40 g/cm³. Composite structures are considered nonwovens provided their mass is constituted of at least 50% of nonwoven as per to the above definitions, or if the nonwoven component plays a prevalent role.”

During the past decade, significant changes have occurred in the worldwide nonwoven market. The predominant regions of the world for the nonwoven production have been restructured. The Asia-Pacific region, including China, shows a potential growth in nonwoven production while the United States and Western Europe continue to develop production technology. The global production of nonwovens reached 4.4 million tons, which is equivalent to $15.9 billion (U.S. dollar). During 2004, 64% of nonwoven materials were produced in North America, Western Europe and Japan. A decade earlier, these regions accounted for slightly higher than 70% of worldwide nonwoven output. The impact on the nonwovens industry is obvious as raw material prices escalate. Major nonwoven producers have faced the challenge, with increasing pressure, to sustain profit margins although raw material prices are not stable. This price volatility continued to impact financial performance of nonwoven companies in 2005. Nevertheless, global nonwoven production is forecast to rise to 6.3 million tons by 2009, or an increase of two million tons from 2004 production levels.
Fig: Forecast Process of Global Market in Nonwoven Production
Understanding the economic backgrounds of the United States, European Union, and Asia (China/ Japan) is critical to understanding the world nonwoven production market. These three predominant regions of the world combined account for more than 60% of the world’s 2005 Gross Domestic Product (GDP), estimated at $37.4 trillion as shown in Table 1 (Central Intelligence Agency (CIA), 2005). The Central Intelligence Agency recently indicated that the world’s GDP grew by more than 9.2%, from 52.89 trillion dollars in 2004 to 60.63 trillion dollars in 2005. However, the European Union’s annual growth in the same period was 4.55% which is a half of the world growth. In contrast, China’s GDP grew almost three times in 2005 even though China has been taking administrative steps to “cool down” the overheated economy and its central bank increased interest rates in 2005 (CIA, 2006).

### Table 1

**Gross Domestic Product (GDP) by World Region**

<table>
<thead>
<tr>
<th>Region</th>
<th>2004 GDP (USD, trillion)</th>
<th>2005 GDP (USD, trillion)</th>
<th>(% share)</th>
<th>Growth Rate 2004 - 2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S.</td>
<td>11.75</td>
<td>12.31</td>
<td>20.30%</td>
<td>4.77%</td>
</tr>
<tr>
<td>European Union</td>
<td>11.65</td>
<td>12.18</td>
<td>20.09%</td>
<td>4.55%</td>
</tr>
<tr>
<td>Japan</td>
<td>3.75</td>
<td>4.03</td>
<td>6.65%</td>
<td>7.47%</td>
</tr>
<tr>
<td>China</td>
<td>2.23</td>
<td>8.88</td>
<td>14.65%</td>
<td>298.21%</td>
</tr>
<tr>
<td>Rest of World</td>
<td>26.13</td>
<td>23.23</td>
<td>38.31%</td>
<td>-11.10%</td>
</tr>
<tr>
<td>World</td>
<td>55.51</td>
<td>60.63</td>
<td>100.00%</td>
<td>9.22%</td>
</tr>
</tbody>
</table>


### World Nonwoven Production:

The global production of nonwovens reached 4.4 million tons which is equivalent to $15.9 billion (USD) and equals approximately 110 million square meters in 2004 (Table 4). Tonnage has increased at an average annual growth rate of 7.4% per year over the past decade. During 2004, approximately 64% of nonwoven materials were produced in North America, Western Europe and Japan. A decade earlier, these regions accounted for slightly higher than 70% of world nonwoven output (Figure 2). This nonwovens industry phenomenon has occurred due, in part, to the industrialization of China. The Chine government is encouraging priva enterprise to expand the industries efficient factories; China now accounts nearly half of the nonwovens output in Asia-Pacific region (INDA, 2005).
In the 19th century, (when England was the leading textile producing country), realizing that large amounts of fiber were wasted as trim, a textile engineer named Garnett developed a special carding device to shred this waste material back to fibrous form. This fiber was used as filling material for pillows. The Garnett Machine, though greatly modified, today still retains his name and is a major component in the non-woven industry. Later on, manufacturers in Northern England began binding these fibers mechanically (using needles) and chemically (using glue) into batts. These were the precursors of today's non-wovens. This art remained the same into the middle of the 20th century and patents as late as the 1930's depict such batts specially made to insulate railroad box cars in the U.S. Now in the 21st century, though some fillings and paddings are still made as they were in England almost 2 centuries ago, non-wovens have progressed beyond Garnett's dreams. Non-woven fabric was used between the Space Shuttle Discovery's heat resistant tiles and the spaceship's skin and non-wovens were part of the space suits worn to the moon. The limits to the use of non-wovens remains only in the imagination of man, and new innovations are developed on a steady basis.

1936 Dr. Carl Nottebohm starts development of Nonwovens in Weinheim
1948 Start of dry-laid staple fiber Nonwovens production, introduction of Vliesline garment interlinings and Vildea window cloth.
1950 Joint Venture to produce dry-laid Nonwovens in USA (Pellon)
1960 Joint Venture to produce dry-laid Nonwovens in Japan (Japan Vilene Company)
1965 Introduction of spun bonded polyamide Nonwovens technology developed by Dr. Ludwig Hartmann.
1982 Production start of lightweight Polypropylene Nonwovens.
1984 Start-up of the first non-European facility to produce polyester spun bonded Nonwovens in North Carolina (USA)
1985 Acquisition of a leading producer of staple fiber Nonwovens in Brazil
1988 Opening of a new research and development centre for staple fiber Nonwovens incorporation hydro entaglement technology in Weinheim
1994 Joint Venture with our Japanese partner Japan Vilene Company to produce interlinings in Suzhou/China.
1998 The Italian company Marelli & Berta, a manufacturer of woven interlinings joins the Freudenberg Group.
1999 Evolon, a new technological breakthrough. The first continuous microfibre spunlaced fabric with a large number of applications.
2002 New Plant Concept: a 50 million investment to modernize and restructure the facilities in Europe and North America
2006 Freudenberg Nonwovens acquires Scimat Ltd, Swindon/UK - the leading finisher of battery separators
2007 Restructuring of the North American industrial business to simplify product ranges and improve supply chain efficiency. Commissioning of a new spunbond line at Fiberweb’s site at Norrköping, Sweden
2008 Creation of two global hygiene business units – Consumer Fabrics and Airlaid, and three regional industrial businesses – Americas Industrial, Europe Industrial and Terram. Acquisition of a Chinese polyester nonwoven fabric producer – Hengguan
2009 Commissioning of a new, leading spunbond line at Fiberweb’s site at Trezzano Rosa, Italy. Formation of a 50/50 JV between Petropar (Brazil) and Fiberweb, comprising Fitesa Brazil and Fiberweb spunbond sites at Washougal, USA and Queretaro, Mexico to form FitesaFiberweb, the second-largest spun bond producer in the Americas
AN ECUMENICAL PERSPECTIVE OF NONWOVEN FABRIC:

SOURCE: ROBERT ELLER ASSOCIATES, INC., 2003

NONWOVEN PATH-TO-MARKET OPPORTUNITY FOR ADDING VALUE

NOTE: ➞ = VALUE ADD OPPORTUNITIES FOR NONWOVENS
The versatility of nonwovens means that they can provide innovative, cost-effective and sometimes unexpected answers to innumerable business challenges. Innovative products and solutions can be created; problems can be solved; and needs met by incorporating appropriate properties. These properties are often combined to create fabrics suited for specific jobs, while achieving a good balance between product use-life and cost. Specific properties can be achieved by selecting raw materials and methods or by applying finishing treatments to nonwovens, such as printing, embossing, moulding, laminating etc.

**Properties include:**

- Abrasion resistant
- Absorbent
- Antistatic
- Biodegradable
- Breathable
- Colour fast
- Conductive
- Crease resistant
- Dense
- Drapeable
- Dry cleanable
- Durable
- Dust free
- Dyeable
- Elastic
- Filtration
- Flame resistant
- Foldable
- Glueable
- Heat sealable
- Impermeable
- Ironable
- Kind to skin
- Light
- Lint free
- Liquid repellent
- Long-lasting
- Mouldable
- Non-conductive
- Non-fading
- Permeable
- Porous
- Printable
- Protective (bacterial barrier)
- Resilient
- Rot and mildew resistant
- Sewable
- Smooth
- Soft
- Stable
- Sterilisable
- Stiff
- Stretchable
- Strong
- Tear resistant
- Washable
- Weatherproof
- Weldable
Nonwoven emerged from the textile, paper and plastic industries and has, for over 40 years, evolved into a distinct industry. As the demand for nonwovens has steadily increased, it has been met by the technology and ingenuity of raw materials and equipment suppliers, and nonwoven producers and converters. The production of nonwovens can be described as taking place in three stages, although modern technology allows an overlapping of some stages, and in some cases all three stages can take place at the same time.

Fig: Manufacturing processes of nonwoven fabric

Nonwoven Technologies

From staple fibers
- Preparation of fiber materials
- Forming fiber layer
- Bonding fiber layer

From polymer
- Melting of polymer
- Forming fibers and fiber layer
The three stages are:

- **Web Formation**
  - Dry laid
    - Carded
    - Air laid
  - Spun melt
    - Spun laid (or spun bonded)
    - Melt blown
  - Wet laid
  - Other technologies
    - Electrostatic spinning
    - Flash spun

- **Web Bonding**
  - Chemical
  - Thermal
  - Mechanical
    - Needle punching
    - Hydro-entanglement
    - Stitch bonding

- **Finishing Treatments**

The opportunity to combine different raw materials and different techniques accounts for the diversity of the industry and its products. This diversity is enhanced by the ability to engineer nonwovens to have specific properties and to perform specific tasks.

**Manufacturing processes:**
Nonwovens are typically manufactured by putting small fibers together in the form of a sheet or web (similar to paper on a paper machine), and then binding them either mechanically (as in the case of felt, by interlocking them with serrated needles such that the inter-fiber friction results in a stronger fabric), with an adhesive, or thermally (by applying binder (in the form of powder, paste, or polymer melt) and melting the binder onto the web by increasing temperature).
**Staple nonwovens:**
Staple nonwovens are made in 2 steps. Fibers are first spun, cut to a few centimeters length, and put into bales. These bales are then dispersed on a conveyor belt, and the fibers are spread in a uniform web by a wet laid process or by carding. Wet laid operations typically use 1/4" to 3/4" long fibers, but sometimes longer if the fiber is stiff or thick. Carding operations typically use ~1.5" long fibers. Rayon used to be a common fiber in nonwovens, now greatly replaced by PET and PP. Fiber glass is wet laid into mats for use in roofing and shingles. Synthetic fiber blends are wet laid along with cellulose for single-use fabrics. Staple nonwovens are bonded by using either resin or thermally. Bonding can be throughout the web by resin saturation or overall thermal bonding or in a distinct pattern via resin printing or thermal spot bonding. Conforming with staple fibers usually refers to a combination with melt blown, often used in high-end textile insulations. Melt Blown nonwovens are produced by extruding melted polymer fibers through a spin net or die consisting of up to 40 holes per inch to form long thin fibers which are stretched and cooled by passing hot air over the fibers as they fall from the die. The resultant web is collected into rolls and subsequently converted to finished products. The extremely fine fibers typically polypropylene differ from other extrusions particularly spun bond in that they have low intrinsic strength but much smaller size offering key properties. Often melt blown is added to spun bond to form SM or SMS webs, which are strong and offer the intrinsic benefits of fine fibers such as fine filtration, low pressure drop as used in face masks or filters and physical benefits such as acoustic insulation as used in dishwashers. One of the largest users of SM and SMS materials is the disposable diaper and feminine care industry.

**Spunlaid nonwovens:**
Spunlaid nonwovens are made in one continuous process. Fibres are spun and then directly dispersed into a web by deflectors or can be directed with air streams. This technique leads to faster belt speeds, and cheaper costs. Several variants of this concept are available, but the Leading technology is the REICOFIL machinery. PP spunbonds run faster and at lower temperatures than PET spunbonds, mostly due to the difference in melting points.
Spun bond has been combined with melt blown nonwovens, conforming them into a layered product called SMS (spun-melt-spun). Melt blown nonwovens have extremely fine fiber diameters but are not strong fabrics. SMS fabrics, made completely from PP are water-repellent and fine enough to serve as disposable fabrics. Melt blown is often used as filter media, being able to capture very fine particles. Spun laid is bonded by either resin or thermally. Regarding the bonding of Spun laid, Rieter has launched a new generation of nonwovens called Spun jet. In fact, Spun jet is the bonding of the Spun laid filaments thanks to the hydro entanglement.

**Air-laid paper:**
Air-laid paper is a textile-like material categorized as a nonwoven fabric made from wood pulp. Unlike the normal papermaking process, air-laid paper does not use water as the carrying medium for the fiber. Fibers are carried and formed to the structure of paper by air.
Other:
Nonwovens can also start with films and fibrillate, serratate or vacuum-form them with patterned holes. Fiberglass nonwovens are of two basic types. Wet laid mat or "glass tissue" use wet-chopped, heavy denier fibers in the 6 to 20 micro meter diameter range. Flame attenuated mats or "batts" use discontinuous fine denier fibers in the 0.1 to 6 range. The latter is similar, though run at much higher temperatures, to melt blown thermoplastic nonwovens. Wet laid mat is almost always wet resin bonded with a curtain coater, while batts are usually spray bonded with wet or dry resin. An unusual process produces polyethylene fibrils in a Freon-like fluid, forming them into a paper-like product and then calendaring them to create Tyvek.

Bonding:
Both staple and Spun laid nonwovens would have no mechanical resistance in and of themselves, without the bonding step. Several methods can be used:
- thermal bonding
  - Use of a heat sealer
  - using a large oven for curing
  - calendaring through heated rollers (called spun bond when combined with Spun laid webs), calendars can be smooth faced for an overall bond or patterned for a softer, more tear resistant bond
- hydro-entanglement: mechanical intertwining of fibers by water jets (called spun lace)
- ultrasonic pattern bonding: used in high-loft or fabric insulation/quilts/bedding
- Needle punching/needle felting: mechanical intertwining of fibers by needles
- Chemical bonding (wet laid process): use of binders (such as latex emulsion or solution polymers) to chemically join the fibers. A more expensive route uses binder fibers or powders that soften and melt to hold other non-melting fibers together
  - one type of cotton staple nonwoven is treated with sodium hydroxide to shrink bond the mat, the caustic causes the cellulose-based fibers to curl and shrink around one another as the bonding technique
  - one unusual polyamide(Cerex) is self-bonded with gas-phase acid
- Melt blown: fiber is bonded as air attenuated fibers intertwangle with themselves during simultaneous fiber and web formation.
**Needle punched Nonwovens Process:**
- Start with staple fiber bale stock
- Fibers are carded and cross laid to desired weight
- Fiber batt is mechanically needled by oscillating needle board
- Barbed needles entangle the fibers vertically
- The more needle boards, the denser the fabric
Spunlaced Nonwovens Process:
• Start with staple fiber bale stock
• Fibers are carded to form a batt
• The batt is either laid on a mesh conveyor or over perforated cylinders
• The batt is then subjected to very high pressure water
• Water entangles the fibers, creating a stable fabric

Fig: Spun laced Nonwovens Process

Cross layering-Vertical cross-lapper or „camel-back“

1) Carded web  2) Feeding belts  3) Couple of reciprocating belts
4) Output belt
Mechanical methods

- Carding – In the carding process, individual staple fibers are separated from clumps of fibers and more or less uni-directionally oriented
- Nonwovens - roller card

Cross layering-horizontal cross-lapper

a) Web  b) Feed belt  c) Upper conveyor belt  d) Lower conveyor belt
e) Delivery belt
Perpendicular laying

1) Carded web  2) Reciprocating comb  
3) Conveyor belt  4) Wire grid  5) Compressing bar

Aerodynamic forming device

1) Condenser screen  2) Lickering  
3) Condenser screen  4) Fan  5) Duct
Manufacturing Process

Combined mechanical-aerodynamic methods

The random card
1) Random roller
2) Two doffer
3) Condensing rollers

Wet forming device

1) Dispersion inlet
2) Inclined wire screen
3) Dewatering pipes
4) Suction box
5) Formed sheet
Combined mechanical-aerodynamic methods

The random card
1) Random roller
2) Two doffer
3) Condensing rollers

Wet forming device

1) Dispersion inlet  2) Inclined wire screen  3) Dewatering pipes
4) Suction box  5) Formed sheet
Manufacturing Process

Wet forming device

1) Dispersion inlet  
2) Stirrer  
3) Forming perforated cylinder  
4) Formed sheet  
5) Adjustable over-flow dam  
6) Dewatering pipes  
7) Free dewatering  
8) Suction dewatering

After Treatment:
The production line is 2.2 meters wide, capable for treatments of flame retardant, hydrophobic, oil & water repellent, powder coating, etc.
Applications:

- Hygiene
- Medical
- Filters
- Geotextiles
- Agriculture
- Personal
- Clothing
- Household
- Other

Nonwoven fabrics are broadly defined as sheet or web structures bonded together by entangling fiber or filaments (and by perforating films) mechanically, thermally or chemically. They are flat, porous sheets that are made directly from separate fibers or from molten plastic or plastic film. They are not made by weaving or knitting and do not require converting the fibers to yarn. Typically, a certain percentage of recycled fabrics and oil-based materials are used in nonwoven fabrics. The percentages of recycled fabrics vary based upon the strength of material needed for the specific use. Conversely, some nonwoven fabrics can be recycled after use, given the proper treatment and facilities. For this reason, some consider nonwovens a more ecological fabric for certain applications, especially in fields and industries where disposable or single use products are important, such as hospitals, schools, nursing homes and luxury accommodations. Nonwoven fabrics are engineered fabrics that may be a limited life, single-use fabric or a very durable fabric. Nonwoven fabrics provide specific functions such as absorbency, liquid repellence, resilience, stretch, softness, strength, flame retardancy, washability, cushioning, filtering, use as a bacterial barrier and sterility. These properties are often combined to create fabrics suited for specific jobs, while achieving a good balance between product use-life and cost. They can mimic the appearance, texture and strength of a woven fabric and can be as bulky as the thickest paddings. In combination with other materials they provide a spectrum of products with diverse properties, and are used alone or as components of apparel, home furnishings, health care, engineering, industrial and consumer goods.
Non-woven materials are used in numerous applications, including:

Current Applications of Nonwoven Fabrics in Automotives:

Nonwoven Use by Automotive Application (square meters):

- Rear shelf: 3%
- Door: 1%
- Insulation: 17%
- Seat: 6%
- Trunk: 13%
- Hoodliner: 10%
- Headliner: 6%
- Miscellaneous: 1%
- Carpet related: 43%

Nonwoven Technologies in Automotive Applications (square meters):

- Spunbond: 66%
- Needled: 27%
- Hydroentangled / Resin: 6%
- Miscellaneous: 1%
Applications

Carpet

Floor Mats
Applications

Dash Insulator

Trunk Mats
Applications

Cockpit / I/P

A / B / C Pillars
Door Trim

Package Tray
Nonwoven in Geotextile

Nonwoven Geotextile (Tech-Geo) - Functions & Applications
Tech-Geo is made from the highest quality PP fibers. It is a Nonwoven Geotextile, needle punched to form a strong fabric that relates its dimensional stability adding years to the life of any roadways, railways, landfill, landscaping, horticulture or civil environmental application. This geotextiles is resistant to UV degradation and biological, chemical environments normally found in soils.

Geotextile Overview:
A Geotextile as defined by ASTM as “Any permeable material used with foundation, soil, rock, earth, or any other geotechnical engineering-related material, as an integral part of a man-made project, structure, or system”. Geotextile are categorized as, woven and nonwoven fabrics.

Functions of Nonwoven Geotextile (Tech-Geo):
- Separation
- Filtration
- Drainage
- Containment
- Protection
- Barrier

Separation:
Tech-Geo acts to separate two layers of soil that have different particle size distributions. This prevents base materials from penetrating into underlying soft subgrade soils, thus maintaining design thickness and integrity of the layer.
Filtration:
This allows water to move through the soil while retaining all upstream soil particles. It is used to prevent soils from migrating into drainage aggregate or pipes while maintaining flow through the system.

Drainage:
Tech-Geo acts as a drain to carry fluid flow through less permeable soils. It dissipates pore water pressures at the base of embankments.

Containment
TechGeo are used in making geo-containers and geo-bags which are used in a wide range of applications.

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Applications

Protection
Tech-Geo is used to cushion Geomembrane liners to prevent liner puncture due to drainage media, stones or other sharp objects. Paving fabrics are used as stress absorbing mechanical inter layers in asphaltic overlays.

Barrier
Techpave nonwoven paving fabrics when saturated with the tack coat functions as a moisture barrier preventing entry of surface moisture into the pavement.

Application Areas:
- Landscaping
- Roof Garden
- Landfill
- Root Barrier System
- Drainage Application
- Erosion Control
- Pavement construction
Applications

Landscaping:

Detail of Section A

1. Green Grass
2. Eco Soil
3. TechGeo for Drainage
4. Pipe Wrapped With TechGeo
5. Base Soil Layer
Applications

Landscape Drainage:
Landscape Drainage products are an economical and environmental friendly option any time. Application includes playing fields, golf courses, providing significant & environmental savings by minimizing the cost. A landscape fabric performs four significant functions: weed restriction, soil separation, reinforcement and filtration. Tech-Geo is highly resistant to acids, alkalis, insecticides, fertilizers and damage from insects and rodents. The weed control fabrics safely eliminate most weeds, while allowing water, air and nutrients to penetrate the plants roots.

Roof Garden:
Tech-Geo provides excellent drainage over the whole base area of the soil layer in addition to providing additional water protection. This product is also environmental friendly; it absorbs and holds 10-12 times its weight of water, acts as capillary dispersion layer and performs the function of geotextiles separator filter.
Landfill:
Tech-Geo nonwovens are used in critical subsurface drainage systems, soil separation and geo-membranes liner protection against containment within landfills. These geotextiles provide the required strength and abrasion resistance to withstand installation and application stresses to create an effective, long-term drainage solution.

Root Barrier:
TechGeo Provides a root barrier against root penetration to protect building path drainage pipes cables and lawns from the damage caused by the growth of tree root. Geotech has characterize of impenetrability to root and it flexible light weight and very easy to install resistant to bacteria and recyclable
Applications

Tech-Geo as drainage:

Erosion control:

Pavement construction:
Absorbent hygiene products
Modern disposable absorbent hygiene products (AHPs) have made an important contribution to the quality of life and skin health of millions of people. Users of AHPs (i.e., baby diapers, feminine hygiene products and adult incontinence products) benefit from the softness, smoothness, leakage prevention, strength and protection provided by nonwoven fabrics.

Some examples of where nonwovens are used
Typical diaper composition:
Applications

Typical feminine hygiene product composition:

Typical tampon composition:

Typical incontinence product composition:
Nonwovens are used in baby diapers, feminine hygiene products and incontinence products as:
• Top sheet or cover-stock
• Leg cuff
• Acquisition / distribution layer
• Core wrap
• Back sheet
• Stretch ears
• Landing zone
• Dusting layer
• Fastening systems

The advantages of using nonwovens instead of traditional textiles
• Excellent absorption
• Softness
• Smoothness
• Stretch-ability
• Comfort and fit
• Strength
• Double fluid barrier effect allowing moisture to be absorbed and retained
• Good uniformity
• High strength and elasticity
• Good strike through, wet back and run off
• Cost effectiveness
• Stability and tear resistance
• Opacity / stain hiding power
• High breathability

Main technologies used
• Air-laid
• Carded nonwovens
• Spun melt
  o SMS
  o Spun bond

Other components of absorbent hygiene products
• Fluff pulp
• Superabsorbent Polymers
• Impervious backing films
• Adhesive
• Elastics
Applications

Agriculture and horticulture:
Nonwovens are used effectively for optimizing the productivity of crops, gardens and greenhouses. Their protective nature means that the need for pesticides is reduced and manual labor is kept to a minimum. The use of nonwoven crop covers on the land increases yields and improves the quality of the crops. Very light, flexible sheets are laid over seed beds, which create a microclimate in which the heat and humidity are controlled. The growth of the plants is accelerated and they are protected from adverse weather conditions and vermin. In capillary mat applications, nonwovens promote the healthy growth of flowers and vegetables in greenhouses by using soil-less growing methods.

Some examples of where nonwovens are used
• Crop covers
• Plant protection
• Seed blankets
• Weed control fabrics
• Greenhouse shading
• Root control bags
• Biodegradable plant pots
• Capillary matting
• Landscape fabric

The advantages of using nonwovens
• Fabrics with high strength, durability and elasticity
• Frost and insect protection
• Exceptional permeability
• Weed control
• Apertures between the intersecting fibers of nonwoven sheets which are big enough to allow air and water to reach the crop but small enough to keep out insects.
• The protection allows plants and crops to grow without the use of pesticides and herbicides
• An earlier development and harvest of the crop, improved yield and a growing year which can be extended at both end

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**Applications**

**Clothing, footwear, baggage**

Nonwovens are a model material for the fashion industry. Used for many decades in hidden, support functions, such as interlinings and components of shoes and bags, today young designers are using nonwovens as a creative and versatile new material. The elegance, style and function of clothes depend largely on the presence and performance of interlinings. Nonwovens are ideally suited for interlinings as they offer substantial advantages over traditional fabrics and indeed count for some two thirds of the interlining market. The success of nonwovens is due to their versatility and the ability to engineer many different properties into them, such as shape-retention, adaptation to the characteristics of the out fabric and lightness in weight. Today, the global retail sector is fascinated with the prospect of incorporating nonwoven fabrics in fashion, sports and outdoor performance apparel as a means of providing something “different” to current woven and knitted apparel.

Some examples of where nonwovens are used

- Interlinings (fronts of overcoats, collars, facings, waistbands, lapels etc)
- Disposable underwear
- Shoe components (Shoelace eyelet reinforcement, Athletic shoe & sandal reinforcement, inner sole lining)
- Bag components
- Bonding agent
- Composition and (wash) care labels

The advantages of using nonwovens

- Dimensional stability (even in high temperature e.g. clothes dryer cycle)
- Easy to slit, die-cut, sew, seam, glue, laminate and trim, without fraying
- Light weight
- Ease-of-use
- Improved adhesion
- Softness
- Easily to add scent, anti-static, and softener treatments
- Non-raveling edges
- Colour stability
- High tear, breaking, puncture and abrasion resistance
- Stretch ability
- Strength Chemically inner

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**Household**

Nonwovens are used in a multitude of household applications ranging from cleaning and filtering to adding an aesthetic touch to the home. Used in bedrooms, kitchens, dining rooms and living rooms, high performance nonwovens can create comfortable, practical, hygienic and beautiful solutions for modern living.

Nonwovens in the home furnishing industry are evolving from use in traditional applications such as upholstery, floor coverings, underlay and blankets to innovative, smart solutions to improve and protect interiors. Recent developments in the home furnishings industry include the creation of nonwovens that kill dust mites in bedding, repel dirt, and contain antimicrobial qualities. Smart nonwovens technology for home interiors combines practicality with safety. Blast resistant curtains, burglar-proof blinds and carpet alarm systems may in fact be the future of home living. The high engineer ability of nonwoven fabrics supports advanced functionality, enabling the development of secure applications. Conventional fabrics on the other hand are restricted in their functionality reach. In the case of blast resistant curtains, the fiber structure in the nonwoven can expand under tension, which allows the material to absorb the pressure shockwave caused by the blast, while simultaneously catching glass and any other debris released by the attack. On the wall covering front, nonwovens are easier to handle than traditional wall paper as the fabric has no seam separation and is simple to remove. In addition, crack-bridging properties make nonwovens perfectly suited for the renovation of problematic ceilings and walls, where exceptional stability is required. As energy prices soar, nonwovens can help deliver a more cost-effective heating solution. Electrically conductive nonwoven fabric, integrated with an underpad, have the potential to heat floor surfaces e.g., wooden floors, ceramic tile floors, walls and ceilings. In such applications, the fabric could ultimately replace traditional interior heating systems by inducing heating by radiation.
Some examples of where nonwovens are used

Abrasives
Bed linen (pocket cloth for pocket springs, separation layer, spring cover, top cover, quilt backing, duvet coverings and pillow cases)
Blinds/curtains
Carpet/carpet backings (scatter rugs, carpet tiles, bath mats etc)
Covering & separation material
Detergent pouches/Fabric softener sheets
Flooring
Furniture/Upholstery (inside lining, reverse fabric for cushions, dust cover, spring covering and pull strips)
Mops
Table linen
Tea and coffee bags
Vacuum cleaning bags
Wall-covering
Wipes (household care, floor care, cleaning, pet care etc)

The advantages of using nonwovens

Ease-of-use
Easy to add scent, anti-static, and softener treatments
Fire-retardancy
Dimensional stability (even in high temperature e.g. clothes dryer cycle)
Easy to slit, die-cut, sew, glue, laminate, trim, saw, clamp and weld without fraying
Non-ravelling edges
Colour stability
High tear, breaking and abrasion resistance
Elimination of risk of delamination
Stretchability
Durability
Strength and uniformity
Anti-allergy and anti-microbial properties
Fluid resistance and retention
Industrial
Nonwovens can offer a broad range of functions thanks to the different manufacturing processes, fibers and treatments. Because of this versatility nonwovens are used widely in many industrial markets, for example:

- Abrasives
- Automotive
- Building
- Cable wrapping
- Carpets/carpet backings
- Civil engineering
- Cleaning, soil/water cleansing
- Coating substrates
- Composites
- Conveyor belts
- Electric/Electronics
- Filtration
- Graphic arts
- Packaging
- Protective clothing
- Wipes
Medical and Healthcare
Nonwovens are extensively used in the medical field and in protection against biological agents in other sectors. For example, they can be designed to deliver critical safety properties, such as protection against infections and diseases. With today’s multi-drug resistant strains of bacteria and virus, nonwovens can help in the fight against cross-contamination and the spread of infection in a medical or surgical environment. Because they are used only once and incinerated after use, the need for handling is avoided and the spread of contaminants is minimized.

Nonwovens are also increasingly a major component in the design of "smart" wound care products, providing such functions as the creation of a moist wound healing environment, with controlled vapor transmission, absorbency and low skin adhesion. Most recent nonwoven innovations include the design of new scaffolds for 3D biological tissue engineering, implantable fabrics that can reinforce natural tissues, and nanofibre nonwoven filtration media offering enhanced particle capture properties. New nonwoven materials with improved finishes including liquid repellent, virus proof and bacterial barrier properties have also been developed for applications such as surgical masks, gowns and drapes, especially in view of the high demands of the new European Standards, EN 13795.
Some examples of where nonwovens are used

- Surgical: disposable caps, gowns, masks, scrub suits and shoe covers
- Drapes, wraps and packs
- Sponges, dressings and wipes
- Bed linen
- Contamination control gowns
- Examination gowns
- Lab coats
- Isolation gowns
- Transdermal drug delivery
- Shrouds
- Underpads
- Procedure packs
- Heat packs
- Ostomy bag liners
- Fixation tapes
- Incubator mattress
- Sterilisation wraps (CSR wrap)
- Wound care
- Cold/heat packs
- Drug delivery (patches etc.)

The advantages of using nonwovens:

- Protection against
  - dry or wet contact
  - air-borne particles
- Fully compliant with EU standard EN 13795
- Single-use = 100% certainty
- Custom-made for the operating theatre
  - procedure-specific design
  - optimum wearer comfort
  - strong yet light in weight
  - optimal fluid absorbency
  - exchange of air, body heat and moisture
- Excellent barrier properties
- Excellent uniformity
- Breathability
- Abrasion resistance and lint free
- Repellency
- Self-adherent edges
- Aseptic folding
- Engineered stability for ETO, plasma, radiation, or steam sterilisation
Applications

**Personal Care Products**
Nonwovens are the ideal material for personal care products. They combine strength and softness, hygiene and handiness.

Some examples of where nonwovens are used
- Absorbent Hygiene Products
- Wipes, skin care
- Depilatory strips

**The advantages of using nonwovens**
- Excellent absorption
- Softness
- Smoothness
- Stretch ability
- Comfort and fit
- Strength
- Can add lotions for specific uses
- Double fluid barrier effect allowing moisture to be absorbed and retained
- Good uniformity
- Good strike through, wet back and run off
- Cost effectiveness
- Stability and tear resistance
- Opacity / stain hiding power
- High breathability
**Upolstered Furniture Applications**

Dust covers on the bottom of upholstered chairs and sofas are generally made from Spunbonded polypropylene or polyester materials. These fabrics, generally black, hide the internal seating construction and prevent house pets or insects from penetrating the upholstered furniture from below.

**Decking fabrics** are the materials under the loose seat cushions. Engineered nonwoven fabrics are often used to replace the higher cost outer fabric. These nonwoven fabrics are usually white but can be colored to coordinate with the upholstered furniture's outer fabric. These fabrics are relatively heavy, in the 100-135 grams/meter² range, as they must be strong enough to withstand stretching forces and hold sewing stitches and construction staples.

**Cushion and pillow** inserts hold the stuffing, such as fiberfill or feathers together to prevent leakage and allow the user to clean or replace the outer fabric. Engineered nonwoven fabrics have captured a high level of penetration by replacing woven cotton materials. Spunbonded materials in this application are usually 40-50 grams/meter².

![Image of upholstered furniture](image)

**Spring insulators** are often made of needlepunched nonwoven materials. Needlepunched nonwovens are relatively abrasion resistant and have the strength to hold staples that fasten the upholstery to the wood frame.

**Upholstered arm and seat** are covered with engineered nonwoven fabrics to provide support for the foam or other cushioning materials covering the wooden frame. These nonwoven fabrics must be strong enough to hold construction staples.

**Tailored skirts** are found on some upholstered sofas and chairs. Spunbonded polyester nonwoven fabrics can be sewn or bonded to the face material providing stiffness or to retain pleats.

**Pull Strips** are often made from narrow strips of engineered nonwoven materials that are sewn to the upholstery fabrics. The upholsterer uses these strips to pull the fabrics tightly over springs and fasten the material to the wooden frame. Engineered nonwoven fabrics compete with a wide assortment of other materials and must be strong enough to hold the stitching and staples. Often fabric scraps are in this end-use.
**Bedding Applications:**

Quilt backing used in bedding construction is one of the larger end-uses for engineered nonwoven fabrics. Nonwoven fabrics are the backing material to which the mattress ticking and foam or fiberfill is quilted. The quilted nonwoven mattress ticking must be strong enough to resist tearing after sewing the mattress top and bottom to the mattress side panels or flanges. Weights of non-woven fabrics used here vary widely with weights as low 10-15 grams/meter² and range up to almost 50 grams/meter² where more "puff" is desired in the quilt.

**Flanges** are the panels of material that surrounds the edge of the mattress and join the mattress top and bottom together. Medium weight Spunbonded materials, generally is wrapped individually so that it can function separately and quietly. Needlepunched material is favored because it resists abrasion, has adequate strength and is heat sealable.

**Mattress Ticking** used on inexpensive mattresses is occasionally made from printed Spunbonded polypropylene. Good stability, strength and the ability to accept a print are the key requirements for this application.

**Insulators** made of various types of engineered nonwoven fabrics are used in mattress construction to cover springs. Needlepunched material is often found here and must have sufficient strength to be fastened into place and resist abrasion.
**Applications**

**Hard Armor Underlayment**
Soil migration and the buildup of hydrostatic pressure are two of the leading causes of failure in hard armor, such as rock riprap and concrete block systems, along shorelines and waterways. Nonwoven geotextiles act as a filter to help prevent subsurface soil migration and relieve hydrostatic pressure beneath hard armor erosion control systems. 801 and 401 meet the requirements for Class 1 and Class 3 erosion control geotextiles, respectively, as outlined in AASHTO M288.

**Landfill Leachate Collection**
When placed in intimate contact with a geonet or drainage stone, medium weight Nonwoven geotextiles can filter soil and waste while allowing water and leachate to pass. An efficient design utilizing recommended Nonwoven geotextiles can lead to proper leachate management in new landfill cells, and rapid surface water collection and removal in closure plans.

**Subsurface Retention/ Detention Systems**
Underground storm water retention systems incorporate large diameter pipe to hold runoff in a defined area until the surrounding soil can accept it. Detention systems, on the other hand, consist of large diameter pipe that detains all runoff exceeding the allowable amount and releases it through an outlet pipe at a controlled rate. Some systems are a combination of both. In each case, subsurface retention/detention systems provide maximum use of land, require little maintenance, and do not diminish the aesthetics of the development.

**Geomembrane Protection**
Heavyweight and ultra-heavyweight Nonwoven geotextiles cushion and protect geomembranes from damage by sharp objects, elevating puncture, impact and abrasion resistance. Nonwoven geotextiles up to 1350gr/m² (40 oz/yd²) are also available for the most challenging applications.

**Gas Collection**
Heavyweight and ultra-heavyweight Nonwoven geotextiles provide collection and lateral transmission of liquids and gasses that may build up beneath flexible geomembranes used in the closure and capping of waste facilities.
Applications

Asphalt Overlays
Pave-Dry nonwoven geotextiles are specifically engineered for asphalt overlays. Pave-Dry Geotextiles are installed during rehabilitation as a fabric interlayer between the old and new asphalt layers in flexible pavement systems. Because polypropylene has an affinity for petroleum products, tack coats easily migrate into the fibers. This creates an inert, laminated composite that has proven to extend roadway life an average of 3 to 7 years.

Nonwoven Selection Guide
Industrial Fabrics offers these traditional nonwoven geotextiles. For additional product information please call us at 800-848-4500.

POLYIMIDE NONWOVENaramid LAMINATE AND PREPREG (85NT):
85NT is a pure polyimide laminate and prepreg system (Tg = 250°C), reinforced with a non-woven aramid substrate. This system combines the high-reliability features of polyimide (improved PTH reliability and temperature stability) with the low in-plane (x,y) expansion and outstanding dimensional stability of a non-woven aramid reinforcement.

Features:
• Low in-plane (x,y) expansion of 6-9 ppm/°C allows attachment of SMT devices with minimal risk of solder failure joint failure due to CTE mismatch
• Nonwoven aramid reinforcement provides outstanding dimensional stability and enhanced registration for improved multilayer yields.
• Decomposition temperature of 426°C, compared with 300-360°C for typical high-performance epoxies, offering outstanding high-temperature lifetime performance
• Polymeric reinforcement results in PCBs typically 25% lighter in weight than conventional glass-reinforced laminates
• Laser and plasma ablatable for high sp microvias and other features as small.
• Electrical and mechanical properties m IPC-4101/53.
• Compatible with lead-free processing.
Typical Applications:
- Military and commercial avionics, missiles and missile defense, satellites, and other high-reliability SMT applications requiring low in-plane (x,y) CTE values
- PCBs that are subjected to high temperatures during processing, such as lead-free soldering
- Applications with significant lifetimes at elevated temperatures, such as aircraft engine instrumentation, on-engine applications, or industrial sensors

Civil:
Roadway Stabilisation / Separation: Roads and highways are built using geotextile to prevent aggregate from mixing with the subgrade. Drainage: Syntex nonwoven geotextiles are ideal for drainage applications. Unlike woven geotextiles (with the exception of monofilament drainage fabrics), polypropylene nonwovens resist clogging. Nonwovens are placed in direct contact with the earth where drainage stone, perforated drain coil, etc. may be placed. The nonwoven filters soil and waste while allowing water and leachate to pass.
Applications

• **Environmental:**
  Geomembrane Protection: Syntex heavy weight nonwoven geotextiles will cushion and protect geomembranes from puncture caused by aggregate and basecourse.

• **Gas Venting:**
  Heavy weight nonwoven geotextiles are used for collection and lateral transmission of liquids and gases that may build up under a geomembrane used in a capping of waste facility.

• **Hard Armour Underlay:**
  Syntex nonwoven geotextiles are recommended to help relieve hydrostatic pressure beneath hard armour and prevent soils from migrating to the surface providing effective erosion control method.

• **Weed Control:**
  A good nonwoven can be engineered to resist UV degradation for specific periods from 6 months to over 2 years. The product has proven to be an economical solution for highway embankments where traditional woven weed control fabrics have not provided adequate water flow to actively promote vegetation. Case studies are available. Again, polypropylene provides superior flow (in particular on slopes or in direct contact with earth).

• **Technical:**
  The Syntex range is manufactured to International Specification and tested by fully accredited laboratories. Properties are produced in both MARV and Typical.

• **Support and Installation**
  Permathene can provide designs by our own Geotechnical Engineers. Where our installation crews specified can provide on-site stitching using industry standard methods.
Most disposable diapers are made with the following basic components:
1) Polyethylene or cloth-like film: This is used as the back sheet, that prevents the liquids from leaking out of the diaper. The back-sheet can also be given a cloth-like look, by adding a thin polypropylene non-woven sheet to the film, using either the hot melt process or the heat and pressure method with direct extrusion to the nonwoven. Contrary to popular belief, the cloth-like back sheet is not cloth -it is made of plastics. Breathable cloth-like material can also be used instead of the film. Not many know that even a breathable diaper with 200 ml of urine loses less than 2.5% of its weight over a period of 24 hours and this evaporation is enough the cool the diaper, which may not be as comfortable at night. For more information about "breathability" please use this link: breathable diapers.

2) Tissue: A special tissue paper that is different from the regular bathroom tissue and has a higher elasticity and wet strength is another important component of a diaper. The tissue essentially serves as a carrier for the pad (the pad is the absorbent core of the diaper) and helps reduce the pin holes created during the compression process carried out by continuous drum forming systems. This tissue, typically at 16 grams/m2 (also abbreviated as GSM) or more, protects the inner plastic from the superabsorbent particles. Instead of tissue, it is possible to use a low gage SMS nonwoven material as the carrier (for the pad), it can be placed right next to the back sheet or as a full wrap material around the core. In order for the SMS carrier to be cost competitive against tissue paper, it needs to be less than 12 GSM.

3) Hot Melts: They are used to glue the different components of the diaper, such as the pad and the elastics. They are made of a mixture of resins, oils and tackifiers. The hot melt adhesive is applied in molten form and when it cools down it provides the required bonding force to glue the materials. Most of the times two types of adhesives are used: a construction adhesive, for the back sheet and the nonwovens, and an elastomeric adhesive, for the leg and waist foam elastics. The elastomeric adhesive has higher elasticity and bonding strength and it is generally more expensive than construction adhesives. When the diaper pad is very thin, another specialty adhesive known as "pad integrity adhesive" is also used to add strength to the diaper core when it is wet. This integrity adhesive is especially useful when SAP loadings exceed 25% of the total pad weight -i.e. when the weight of the SAP is more than a quarter of the weight of the pad. For a list of hot melt suppliers follow this link: Hot Melts.
4) **Hydrophobic Non-woven:** It is used as a top sheet for the leg cuffs; it prevents water from passing through. It is made of polypropylene resin without any added surface surfactants. The hydrophobic nonwoven prevents leakage out of the diaper. By applying a surfactant to a restricted area, it is possible to make a roll of hydrophobic nonwoven only partially philic. This is known as the Zebra process and it is an important feature designed to avoid leakage during leg cuff construction. For nonwoven suppliers use this link: Nonwovens.

5) **Hydrophilic Non-woven:** It is the main top sheet, the top surface that is in contact with the baby's skin. It allows the liquids to flow into the diaper core. The difference between the two non-woven (philic and phobic) is the surfactant treatment used in the process. The surfactant treatment reduces the surface tension of the nonwoven, reduces the contact angle with the liquid and allows it to pass. Flow dynamics within the diaper core prevent liquids from returning to the surface. Most nonwovens used in diapers are made with the spun bonding process, though it is possible to use thermal bonded nonwovens also, which are softer but have lower resistance and strength. Through Air Bonded nonwovens which are more lofty, can also be used. For nonwoven suppliers use this link: Nonwovens.

6) **Elastics:** Used to improve the fit of the diaper, usually made of polyurethane or polyester foam, synthetic rubber or Lycra® (also known with the generic name Spandex). They are used in cuffs, for the waist and the legs; they can also be used as lateral side panels and in tape construction. Most gasketing cuffs use spandex to provide a seal with the baby's legs. Spandex can stretch as much as 400% of its original length before it breaks, however it is typically used at less than 300% stretch. New generations of softer and stronger elastic materials are reportedly in the pipeline. For a list of suppliers use this link: Elastomerics.
7) **Lateral Tapes**: In premium diapers, Velcro® type materials have been used to provide mechanical grip, it is also known as the "hook tape". In lower priced diapers, adhesive tapes made of polypropylene are used. Then there are new versions of elasticized Nonwoven Velcro Tapes. In a few years baby diapers may replace training pants with the help of these new stretchable fastening systems that offer the same characteristics to the consumer but cost less. Some adult diapers use what is called the "target tape" system, where the tape has two adhesive tabs to avoid the need for a frontal tape. This is a cheaper alternative for adult diapers but not as good as the one using a frontal tape which does not require repositioning of the tape on top of the target. For a list of suppliers use this link: Tapes and Closure systems.

8) **Frontal Tapes**: This is used to facilitate multiple repositioning of the lateral tape without tearing the back-sheet, it is made of polypropylene film and attached to the front of the diaper with adhesive. Its use has helped to reduce the thickness of the poly film without the risk of potential tears associated with the opening of the lateral tapes from the backsheet. In premium diapers, a special loop system has been developed in order to use of Velcro type fasteners (also called the "hook and loop" system). This loop tape can use a "locked loop" or a "brushed loop" in order to provide a softer texture or a stronger grip. A new generation of nonwoven materials expected to be commercialized in a few years, may eliminate the need for frontal tapes - the whole backsheet will be used to reposition mechanical tapes. The frontal tape can have a printed design which can be random or synchronized; some patents may protect the use of synchronized printing in some markets. Tapes and Closure systems.
9) **Cellulose**: Used in the construction of the pad, it gives integrity and absorbing capacity to the diaper. The capacity of normal cellulose pulp is around 10 cc of water per gram of pulp when the diaper is in "free swell" but less than 2 cc when subjected to 5 KPa of pressure; that is why a superabsorbent material is also needed to hold the liquids under pressure. Cellulose comes from pine trees, generally obtained from well managed forests. Liquids are absorbed by the capillaries in the void spaces between the fibers and the surface tension angle between the fibers and the water. Typical fiber length used in diapers is about 2.6 mm. An alternative to pulp is to use air laid synthetic fibers. However, it is still difficult for air laid synthetics to compete with pulp, unless it is a niche market product and thickness is more important for the consumer (as in case of some sanitary napkins and the adult diapers used by active people) than the cost. Cellulose acetate, the material used to make cigarette filters, has been used in some absorbent products. A PP synthetic fiber has also been attempted for absorbent core formation. For a list of pulp suppliers use this link: Fluff Pulp.

10) **Acquisition and Distribution Layer**: Also known with its abbreviation ADL, it is a sub layer used between the top sheet and the absorbent core. Sometimes used in full length but mostly preferred as a patch near the target zone where urine is most likely to be deposited. This sub layer is specially needed when the absorbent core is very thin -the sub layer quickly moves liquids into the absorbent core and reduces potential leakage. The ADL is very important to provide a sense of dryness to the skin, providing additional separation between the wet pad and the skin. ADL's should be used whenever the mix of SAP in the absorbent core exceeds about 15% by weight or when the liquid penetration time requires a boost in order to avoid diaper leakage due to liquid accumulation inside the diaper. ADL's are made either of through air bond (TAB) nonwovens, "curly" fibers such as in P&G's pampers and some Ontex diapers, or some kind of "high loft" nonwoven. An aperture film, made of perforated plastic film, has also been used successfully in some markets. Lower priced diapers sometimes use resin bonded nonwovens, but they do not work as well. For acquisition nonwoven suppliers use this link: Nonwovens.
11) Sodium Polyacrylate: Also known as super-absorbent or "SAP" (super absorbent polymer), Kimberly Clark used to call it SAM (super absorbent material). It is typically used in fine granular form (like table salt). It helps improve capacity for better retention in a disposable diaper, allowing the product to be thinner with improved performance and less usage of pine fluff pulp. The molecular structure of the poly-acrylate has sodium carboxylate groups hanging off the main chain. When it comes in contact with water, the sodium detaches itself, leaving only carboxyl ions. Being negatively charged, these ions repel one another so that the polymer unwinds and absorbs water, which is attracted by the sodium atoms. The polymer also has cross-links, which effectively leads to a three-dimensional structure. It has high molecular weight of more than a million; thus, instead of getting dissolved, it solidifies into a gel. The Hydrogen in the water (H-O-H) is trapped by the acrylate due to the atomic bonds associated with the polarity forces between the atoms. Electrolytes in the liquid, such as salt minerals (urine contains 0.9% of minerals), reduce polarity, thereby affecting superabsorbent properties, specially with regard to the superabsorbent capacity for liquid retention. This is the main reason why diapers containing SAP should never be tested with plain water. Linear molecular configurations have less total capacity than non-linear molecules but, on the other hand, retention of liquid in a linear molecule is higher than in a non-linear molecule, due to improved polarity. For a list of SAP suppliers, please use this link: SAP

Example of a linear molecule

The superabsorbent can be designed to absorb higher amounts of liquids (with less retention) or very high retentions (but lower capacity). In addition, a surface cross linker can be added to the superabsorbent particle to help it move liquids while it is saturated. This helps avoid formation of "gel blocks", the phenomenon that describes the impossibility of moving liquids once a SAP particle gets saturated. Please read the history section for more information. To get more answers about this superabsorbent material, please use the link: Frequent questions about SAP
12) Top Sheet surface add-on lotions: In order to create novelties for product differentiation, several topical lotions are added to the nonwoven top sheet, among others: Aloe Vera, Vitamin E, Petrolatum, Almond Oil, Vitamin D, Oat Extract, Jojoba, etc. There is another trend to use antibacterial lotions (such as tertiary ammonia or silver salt compounds); however, many pediatricians are against its use for obvious reasons.

13) Decorated Films and wetness indicators: For even greater product differentiation, some diapers use decorated films underneath the cloth-like backsheet. Some use as many as nine inks with all kinds of well known characters such as Disney, Sesame Street, Soccer teams, etc. Another gimmick they use is a wetness indicator. This is typically used for adult products but some baby diapers also use it.

Other Applications

Protective mattress pads are generally quilted and use large volumes of spunbonded nonwoven fabrics as facing and backing materials. In this application, nonwoven fabrics have captured about half of the total volume and compete directly with woven cottons. Spunbonded polyester is often used as it is strong and retains its shape during laundering. Facing fabrics are generally 42-65 grams/meter², while backing fabrics are usually in the 15-20 grams/ meter² range.

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. This research focuses on the prediction of the future global nonwoven production by analyzing information about the global economic condition, the current market of nonwoven production, and the production trends of polypropylene (PP) and polyester (PET) which are most widely used as raw materials in nonwoven industry.
References:
Robert Czajka, Development of medical textile market.
Joanna Grzybowska-Pietras Jadwiga Malkiewicz, Influence of technologic parameters on filtration characteristics of nonwoven
The Diaper Industry Source The use of Non wovens in the hygiene industry (Richer Investment manufactured by Reifenhäuser REICOFIL GmbH & Co. KG (Germany)
Rieter Nonwovens Systems