

INTRODUCTION TO NONWOVENS

1. DEFINITION OF NONWOVEN

An average person is unlikely to be familiar with the term *Nonwovens* and a few decades back there were no experts in this field. When the consumer hears the term Nonwovens it makes him think of something, which is not like traditional woven fabrics, something modern, advanced, hygienic, but he is not aware of any specific types of materials among those which carry the same name. But now the precise meaning of the term is somewhat clearer to the experts. According to the experts, Nonwovens is a class of textiles/sheet products, unique in industry, which is defined in the negative; that is, they are defined in what they are not. Nonwovens fabrics are different than the conventional textile fabrics and paper. Nonwovens are not based on yarns and (with frequent exceptions) do not contain yarns. They are based on webs of individual fibers. Nonwovens are different than paper in that nonwovens usually consist entirely or at least contain a sizeable proportion of long fibers and/or they are bonded intermittently along the length of the fibers. Although paper consists of fiber webs, the fibers are bonded to each other so completely that the entire sheet comprises one unit. In nonwovens we have webs of fibers where fibers are not as rigidly bonded and to a large degree act as individuals [1].

The definitions of the nonwovens most commonly used nowadays are those by the Association of the Nonwovens Fabrics Industry (INDA) and the European Disposables and Nonwovens Association (EDANA).

1. 1. INDA DEFINITION:

Nonwovens are a sheet, web, or bat of natural and/or man-made fibers or filaments, excluding paper, that have not been converted into yarns, and that are bonded to each other by any of several means.

The various methods for bonding are:

- a) Adding an adhesive
- b) Thermally fusing the fibers or filaments to each other or to the other meltable fibers or powders.
- c) Fusing fibers by first dissolving, and then resolidifying their surfaces.
- d) Creating physical tangles or tuft among the fibers.
- e) Stitching the fibers or filaments in place.

1. 2. EDANA DEFINITION:

Nonwovens are a manufactured sheet, web or bat of directionally or randomly oriented fibers, bonded by friction, and/or cohesion and/or adhesion, excluding paper or products which are woven, knitted, tufted stitch bonded incorporating binding yarns or filaments, or felted by wet milling, whether or not additionally needled. The fibers may be of natural or man-made origin. They may be staple or continuous or be formed in situ.

2. APPLICATIONS OF NONWOVENS

Nonwovens find numerous applications ranging from baby diapers to industrial high performance textiles. Some of the important areas where nonwovens are treated as primary alternative for traditional textiles as Geotextiles, materials for building, thermal and sound insulating materials, hygienic and health care textiles and automotive industries. Nonwovens are also used in cover stocks, agriculture, aerospace, home furnishings etc. Although it is not possible to list all the applications of nonwovens, some of the important applications are listed in Table 1 [2].

Table 1 - Products That Use Nonwovens		
Agriculture and Landscaping	Home Furnishings	Industrial/Military
Crop Covers	Furniture construction sheeting	Coated fabrics
Turf protection products	Insulators, arms and back	Filters
Nursery overwintering	Cushion ticking	Semiconductor polishing pads
Weed control fabrics	Dust covers	Wipers
Root bags	Decking	Clean room apparel
Containers	Skirt linings	Air conditioning filters
Capillary matting	Pull strips	Military clothing
	Bedding construction sheeting	Abrasives

Automotive	Quilt backing	Cable insulation
Trunk applications	Dust covers	Reinforced plastics
Floor covers	Flanging	Tapes
Side liners	Spring wrap	Protective clothing, lab coats
Front and back liners	Insulators	Sorbents
Wheelhouse covers	Quilt backings	Lubricating pads
Rear shelf trim panel covers	Blankets	Flame barriers
Seat applications	Wallcovering backings	Packaging
Listings	Acoustical wallcoverings	Conveyor belts
Cover slip sheets	Upholstery backings	Display felts
Foam reinforcements	Pillows, pillow cases	Papermaker felts
Transmission oil filters	Window treatments	Noise absorbent felt
Door trim panel carpets	Drapery components	
Door trim panel padding	Carpet backings, carpets, and	Leisure, Travel
Vinyl, landau cover backings	Pads	Sleeping bags
Molded headliner substrates	Mattress pad components	Tarpaulins, tents
Hood silencer pads		Artificial leather, luggage
Dash insulators	Health Care	Airline headrests, pillow cases
Carpet tufting fabric and	Surgical: caps, gowns,	

under	masks,	
Padding	Shoe covers	Personal Care and Hygiene
	Sponges, dressings, wipes	Diapers
Clothing	Orthopedic padding	Sanitary napkins, tampons
Interlinings	Bandages, tapes	Training pants
Clothing and glove insulation	Dental bibs	Incontinence products
Bra and shoulder padding	Drapes, wraps, packs	Dry and wet wipes
Handbag components	Sterile packaging	Cosmetic applicators, removers
Shoe components	Bed linen, underpads	Lens tissue
	Contamination control gowns	Hand warmers
Construction	Electrodes	Vacuum cleaner bags
Roofing and tile underlayment	Examination gowns	Tea, coffee bags
Acoustical ceilings	Filters for IV solutions, blood	Buff pads
Insulation	Oxygenators and kidney	
House wrap	Dialyzers	School, Office
Pipe wrap	Transdermal drug delivery	Bookcovers
		Mailing envelopes, labels
Geotextiles	Household	Maps, signs, pennants

Asphalt overlay	Wipes, wet, dry polishing	Floppy disk liners
Road and railroad beds	Aprons	Towels
Soil stabilization	Scouring pads	Promotional items
Drainage	Fabric softener sheets	Pen nibs
Dam and stream embankments	Dust cloths, mops	
Golf and tennis courts	Tea and coffee bags	
Artificial turf	Placemats, napkins	
Sedimentation and erosion	Ironing board pads	
Control	Washcloths	
Pond liners	Tablecloths	

Source: The Nonwoven Fabrics Handbook, Association for the Nonwoven Fabrics Industry, Cary, North Carolina

3. PRODUCTION AND SHIPMENTS OF NONWOVENS

The Nonwoven industry is one of the fastest growing industries in the world. It is rapidly developing a sophisticated and diverse market. It has been exhibiting an average growth of about 10% over the past twenty years and should continue this rate of growth in the next ten years. The technology in Nonwoven industry has been improved significantly in nearly all available major manufacturing processes, including those of spun bond, meltblown, needle punched, spunlaced, wet laid and dry laid fabrication. The most important point in rapid development and commercial acceptance of nonwovens is the ability to produce materials of special properties in less time and at reasonable prices. The relative production speeds of various textile technologies are compared in Table 2 [3,4].

Table 2 Relative production rates of different Textile technologies

Technology	Relative Production Rate
Weaving	1-6
Knitting	3-16
Nonwovens - web forming: -Carding -Spunbond -Wet-laid	120-400 200-2000 2300
Nonwovens - bonding -Stitchbonding -Needling -Calendaring -Hot air bonding	40 30-500 2000 5000

A large number of fibers are available in the market, but the Nonwovens market is mainly dominated by three fibers, namely polyolefin's, polyester, and rayon. These three fiber types make up a substantial part of the overall Nonwovens markets for fibers [5]. The North American Nonwovens industry is the largest in the world and accounts for almost one third of the worldwide sales of roll goods - around \$2.8 billion - in 1997, according to estimates from the Association of the Nonwovens Fabrics Industry (INDA). A major portion of the polyolefin and polyester fiber in the U.S. market is consumed by the Nonwovens industry. Last year (1998), 57% of the polyolefin share was consumed by the Nonwovens industry and only 43% was consumed by all the other industries, in spite of the fact that polyolefin's are the major raw products for the packaging industry. Even in the case of polyesters, the share has increased to 14%. The major share of polyester fiber goes to high loft industry.

Table 3 U.S. shipments of olefin staple: Nonwovens Vs Other Markets,
1989-1998

YEAR	Total U.S.	Shipped to Nonwovens	All Other
1989	363	195	168
1990	388	233	155
1991	438	272	166
1992	441	259	182
1993	466	276	190
1994	489	280	209
1995	458	267	191
1996	515	295	220
1997	542	314	229
1998	596	339	257
CAGR, 1989/98	5.6%	6.4%	4.9%

Source: Fiber Economics Bureau and Trade Estimates, CAGR- Compound annual growth rate.

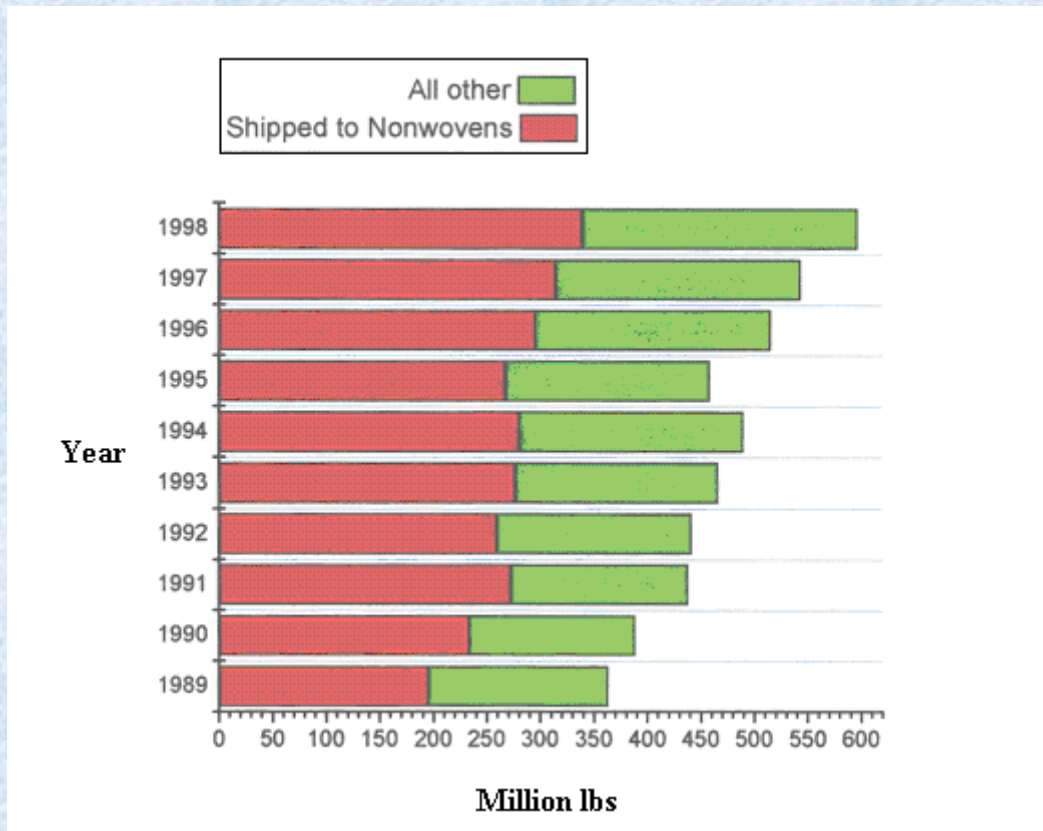


Fig 1 US shipment of olefin fibers: Nonwovens Vs other markets 1989-1998

Table 4: Relative production of different textile technologies

YEAR	Total U.S.	Shipped to Nonwovens	All Other
1989	2261	272	1989
1990	2015	240	1775
1991	2128	237	1891
1992	2191	244	1947

1993	2158	263	1895
1994	2221	280	1941
1995	2100	280	1820
1996	2016	285	1731
1997	2250	285	1965
1998	2105	292	1813
CAGR, 1989/98	-0.7%	0.8%	-1.0%

Source: Fiber Economics Bureau and Trade Estimates,

The production of Nonwovens amounts to approximately 20% of the total production of textiles and this percentage grows year by year. The world production of Nonwovens is shown in Table 5[6]. The growth rates of Nonwovens production are extremely high, when compared with the conventional textiles industry.

Table 5. World Production of Nonwovens [6]

	2001(tons)	2002(tons)
West Europe	1,115,700	1,203,100
USA	1,024,000	1,074,000
Japan	298000	296000
China	417000	477000
Other AFMA Members	238700	244700

Others	560000	620000
Total	3,653,400	3,915,500

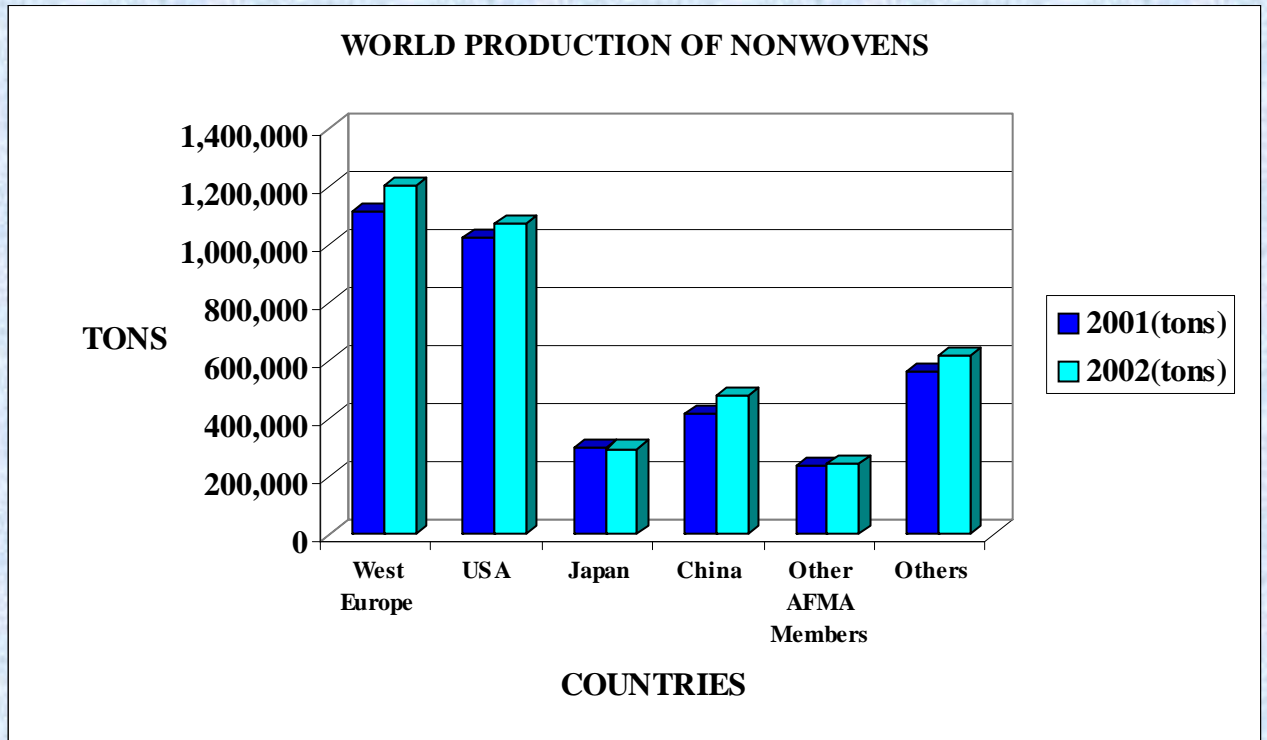


Fig. 2 World Production of Nonwovens [6]

Table 6. Leading producers of Nonwovens [7]

Company	Country	Worldwide Sales (Millions USD)
Freudenberg	Germany	1,117
DuPont	USA	800
PGI	USA	600

BBA Group	UK	500
Kimberly-Clark	USA	482
Veratec	USA	300
Japan Vilene	Japan	295
Dexter	USA	284
Hoechst	Germany	189
Asahi	Japan	172
Toyobo	Japan	155
Akzo Nobel	The Netherlands	150
Lantor	The Netherlands	132
Walkisoft	Finland	128
Amoco	USA	125

With the nonwovens successfully moving into more technical end-uses, the fiber requirements have also become more important with regard to the fiber properties. The cooperation between fiber supplier and fabric producers is now seen as important criteria for more advancement to come about in the nonwovens field.