

Nonwovens Made of Cotton

Cotton is gaining importance as a raw material for a growing range of nonwoven products.

**By Jürg Rupp, Executive Editor
Editor**

The year 2009 will be a very special year for cotton - not only because the United Nations General Assembly has declared 2009 as the International Year of Natural Fibres (IYNF), but also because the US government is offering funds to textile manufacturers that use cotton. It's common sense that cotton is playing a very important role in the traditional textile industry, but also more and more for sectors of the nonwovens industry, such as medical, personal hygiene and many others.

IYNF was launched in January at the headquarters of the Food and Agriculture Organization of the United Nations in Rome, Italy. Natural fiber industries provide employment to hundreds of millions of people across almost all countries. Natural fibers are renewable, sustainable and economical, and provide excellent performance characteristics for consumers.



Cotton makeup pads are one product on an endless list of cotton products made of nonwovens

Time For Investment

In the United States, the Food, Conservation, and Energy Act of 2008 and the Upland Cotton Economic Adjustment Assistance Program present interesting opportunities for domestic users of eligible upland cotton, including spinners, papermakers and nonwoven cotton product producers. The program makes funds available over a five-year period to such producers, providing possibly as much as \$365 million or more to invest in plants and equipment as well as new and/or upgraded product lines (See "[Cotton Funding Promotes Investment,](#)" *this issue*).

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Human-Centered Textile Products

Human beings are more and more at the center of all their own activities, mainly in Western countries, but also increasingly in the developing countries. This is also the case in the textile industry in general and for nonwovens made of cotton in particular. Examples are products for all kinds of protective clothing, medical applications, hygiene applications, environmental protection and home textiles.

Fiber-based nonwovens have the same initial production stages as any spun yarn: the opening process; blending, if specified; and carding. In mechanical bonding, web-strengthening is achieved by fiber friction as a result of the physical entanglement of the fibers. There are two types of mechanical

bonding: needlepunching and hydroentangling.

Needlepunching can be used on most fiber types. However, the majority of cotton nonwovens are bonded using modern spunlace, or hydroentangling, technology. As previously mentioned, hydroentangling is applied mainly to carded or wetlaid webs and uses fine, high-pressure water jets to cause the fibers to interlace. The arrangement of jets can give a wide variety of aesthetically pleasing effects. The water-jet pressure used has a direct bearing on the strength of the web, but system design also plays a part.

Some Cotton Nonwoven Products

Personal Care/Hygiene

Baby diapers
Feminine hygiene products
Adult incontinence products
Dry and wet wipes
Training pants
Cosmetic removal pads
Nursing pads
Nasal strips
Adhesive for dental plates
Disposable underwear

Wipes

Industrial wipes
Surgical wipes

Medical

Surgical: disposable caps, gowns, masks and shoe covers
Drapes, wraps and packs
Sponges, dressings and wipes
Bed linens
Contamination control gowns
Examination gowns
Transdermal drug delivery
Shrouds
Underpads
Procedure packs
Heat packs
Ostomy bag liners
Fixation tapes
Incubator mattresses

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Bleached Cotton

Bleached cotton has become a very attractive material in the last few years, says Jean-Philippe Dumon, sales and marketing director of France-based NSC nonwoven, thanks to its competitiveness against viscose and its "green" approach. It helps nonwovens producers' marketing efforts to renew their customers' interest in their products. Two main end-uses, using spunlacing bonding technologies, are pads and wipes.

Cotton pad end-uses require fabric weights of between 150 and 250 grams per square meter (g/m²). More and more, airlay technology is considered for this application. Throughput in excess of 250 kilograms per hour (kg/hr) is possible when fiber length is long enough. When one considers that a cotton pad weighs only 1 gram, it means a great number of pieces are produced per minute. Modern production units often have a width of 250 centimeters.

The trend is to use more and more cotton waste coming from spinning mills that generate blowroom waste of 12.3 millimeters (mm) average length, card waste of 14 mm average length and cotton noils of 18 mm average length.

Production speeds recently have significantly increased. Because cotton pads have little tensile strength to offer and a bulkiness to preserve, the selection of the winder has become more and more important, especially to prevent tension variation during the critical phase of bobbin changes. The EasyWinder from NSC has been particularly successful with two installed units in 2008, Dumon said. For wipes in 100-percent cotton or in blends, the fabric weight range is similar to that for conventional wipes, from 40 to 55 g/m². Depending on the cotton qualities, the production level can exceed 200 kg/hr.

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Cards And Maintenance Are Essential

According to Dumon, the VarioWeb® three-doffer card is ideal for running such a range of products using a single card. The three doffers and the specific vertical web stripping device provide a very bulky effect.

Working at high speed with short and dusty fibers is a big challenge. Dust must be collected automatically, and the equipment must be designed so that dust does not accumulate easily in areas difficult to reach. The Exelle® card features these characteristics, and its easy-maintenance features make it very attractive for wipe producers. A production line designed for cotton also will easily run the conventional viscose/polyester or polypropylene wipes.

The CleanSystem increases effective production time between two maintenance cycles. The modular concept and the motorized opening system decrease the time as well as mechanical and human resources required for maintenance preparation. Cotton as shoddy material is not a new thing, but its application field is growing thanks to its sound insulation properties. It is widely used in the automotive industry, and there is growing interest in its use for home insulation. Nevertheless, fireproofing techniques still remain to be improved in that field.

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Heavy Fabrics

For heavy materials, the ideal web-formation equipment is an airlay machine. There are two options for consideration. The first is through-air bonding, which blends cotton fibers with bicomponent low-melt fibers and is preferred when stiffness is required. Mechanical needling can be used prior to through-air bonding. The second option is needlepunching, which is considered increasingly as a more competitive alternative to thermobonding because it provides a better hand for some applications. It is also a cheaper bonding alternative to the use of bicomponents.

When both bonding technologies are used, the amount of bicomponent fibers is reduced to save cost. For light to medium weight, card and crosslapper are preferred to obtain a better weight distribution. Regarding bonding technology, NSC provides the same options as for heavy fabrics by using through-air bonding and/or needlepunching.



Dr. Rajaram Jaipuria, chairman and managing director of Indian

spinner Ginni Filaments Ltd., invested a lot of money in nonwovens production, mainly for cotton products.

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Consumer Acceptance

André Michalon, sales director of France-based Rieter Perfojet S.A., is convinced that cotton is promising because of its acceptance on the consumer side, and his company values this fiber as a priority. In the United States, because of promotional activities by Cary, N.C.-based Cotton Incorporated, cotton has made up a respectable volume of the wet wipes commodity business.

In other areas, such as cotton pads, Rieter Perfojet has been very successful because of the strength of its patterning cylinder, the Perfojet. This original patented technology from Rieter uses water jets to create any geometric or artistic pattern on a cotton web.

The market trend is to design patterned fabrics, thus creating product differentiation and brand recognition by the consumer. The creation of designs on fabric processed on the JETlace® 3000 is possible using the patent-pending technology of the patterning sleeve, which enables special fabrics to be produced without affecting line speed, thus enabling operation at optimal, efficient speeds. This system allows production of a large range of designs and logos for personalizing nonwovens. Patterning is achieved using an embossed cylinder located in front of the final conveyor of the JETlace 3000, following the initial entanglement stages.

According to Michalon, Rieter's involvement in the cotton field for more than 200 years puts the company in a position to propose innovative solutions for producing cotton webs in the most economical way. Today, 50 out of the 150 Rieter Perfojet machines installed worldwide are running cotton in 16 countries. A new machine solution for cotton pads is to be introduced in the second quarter of 2009.

In the nonwovens sector, cotton is not presently the main fiber, but rather is an added-value fiber used for solutions in specific markets. On the technical side, the fiber structure requires engineering of state-of-the-art, sophisticated water filtration in line with current specifications related to downtime and maintenance costs. Any existing hydroentangling machine can be upgraded to cope with bonding of 100-percent cotton or blends.

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Finishing Treatments

Tailor-made products and manufacturing processes are two of the basic reasons behind the continuing and overwhelming success of technical textiles and nonwovens. Finishing plays an outstanding role in the production of these products. Appropriate finishing can make a fairly simply manufactured fabric or nonwoven into a high-performance product. There is an opportunity to meet customer needs even more precisely by modifying or adding to existing properties. Some European finishing manufacturers already have had success in this sector. A variety of different chemical substances also may be used before or after binding, or various mechanical processes may be applied to the nonwoven after binding.

Nonwovens may be made conductive, flame-retardant, water-repellent, porous, antistatic, breathable, and absorbent - the list is endless. They also may be coated, printed, flocked or dyed; and may be combined with other materials to form complex laminates.

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Recycling

Today, special attention is focused on resource protection, energy saving and recycling. With the use of architectural textiles, the industry is in a position to create large covered spaces with a minimal use of materials. Products will be developed and used that have the longest possible life span and offer the

greatest possible degree of recyclability. Depending on the region, the "develop, use and dispose" mentality has survived right up to the present day. Those who considered the possibilities of recycling at an early stage often were designated as "green" or idealistic. Nevertheless, for many years, the textile industry has been among the forerunners in the area of raw material recycling. The recycling of waste has not only ecological, but also economical advantages.

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Don't Waste Your Waste

As NSC nonwoven's Dumon mentioned, the trend is more and more to use cotton waste coming from spinning mills that generate waste from the blowroom and card. As an example, at INDEX 08 in Geneva, Ginni Filaments Ltd. - a new exhibitor and a prominent spinner in India - showed its first nonwovens. Chairman and Managing Director Dr. Rajaram Jaipuria has invested a lot of money in nonwovens production, mainly for cotton products. The products most in demand at INDEX were wipes and medical items, but printed nonwovens made of cotton fibers also were in demand. As Jaipuria said, "At the moment, being a newcomer in this market, they are only selling to our neighboring countries." He also said it must be the duty of the industry to explore new markets such as India by explaining the advantages of nonwoven products, and using the appropriate communication. Let's go for it.

Textile World January/February 2009

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