COTTON NONWOVENS RESEARCH AT THE SOUTHERN REGIONAL RESEARCH CENTER

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Research on cotton nonwovens began at the Southern Regional Research Center (SRRC) as early as 1970.[1] This early work was devoted principally to improving cotton batting for use in mattresses and upholstered furniture. Because compaction and flammability were matters of immediate concern to the expanded use of cotton in these areas, various approaches involving standard crosslinking agents, for enhanced resiliency and resistance to compaction, and both durable and nondurable fire retardants were examined. Significantly improved cotton batting was realized by this work.

In the late 1980s, with the advent of readily available polyethyleneglycols, these polymers were found to be excellent enhances to a number of physical properties of both woven and nonwoven textiles including improved thermal, mechanical and moisture absorbent properties. The work of Vigo and Bruno[2] did much to provide shrinkage stability, improved moisture absorption and greatly increased moisture holding capacity.

With the realization that low melting polypropylene (PP) could be blended with bleached cotton and that the blend could then be thermally bonded with heat. A study was undertaken by scientists at SRRC[3] to study the effect of blend levels and bonding temperatures on the breaking strength, elongation, stiffness and absorbency of nonwoven composites. When the combined properties of strength, hand, and absorbency were considered, high cotton blend nonwovens performed as well, if not better than 100% polypropylene nonwovens.

Because of the increased incidence of oil spills, the problem of effective cleanup required that improved nonwoven oil spill cleanup mats be developed. At that time, the standard for the industry was a 100% PP nonwoven mats. A number of blends of grey cotton and polypropylene were studied ranging from 100% cotton to 100% polypropylene. These were evaluated in both laboratory and under simulated spill conditions. Oil sorption was found to increase as the percentage of cotton increased. Strength properties conversely increased with an increase in PP.[4]

Early in the 1990's, kenaf was first considered a good candidate for a value-added agricultural crop. It was a crop very attractive to use on poor land or on land being recycled with a number of primary crops such as cotton or vegetables. Moreau and Tao[5] studied the purification and separation of kenaf fiber from the bark and core present in most sources of kenaf. While physical separation methods were found satisfactory for producing kenaf fibers for many nonwoven blend applications, cardable fibers were only produced by either bacteriological or chemical means.[6] Recent demand for lighter weight and "green" automobiles encouraged some limited work on kenaf-containing nonwoven blends as well as on nonwoven blends of cotton mill fly with suitable synthetic fibers. These natural materials were chosen because of their lightweight and inexpensive cost. This research is on going at SRRC.

Although standards for woven gauze have been contained in the U.S. Pharmacopeia for many years, the introduction of nonwoven "spunlaced" gauze has indicated a need for new standards to be also included in the Pharmacopeia for this nonstandard gauze-like textile. Dr. Parikh has provided an extensive listing of spunlaced gauze standards and published it as a stimuli for ultimate inclusion in the Pharmacopeia.[7]

More recently, Dr. Parikh and his associates have conducted research to incorporate bleached cotton linters into blends with longer short cotton fibers intended for nonwoven facial wipes and similar products. The results have been very encouraging. These new facial wipes have proved to have an excellent feel and increased absorbency. They could be produced with less material costs than their current commercial competitors. Mercerized cottons and carboxymethylated cottons have also been used in blends of modified cotton/synthetic nonwovens for enhanced moisture holding capacity in sanitary products, bandages, and other emerging nonwovens applications. In many cases, the benefits of increased moisture holding capacity more than outweigh the increased cost of mercerization or carboxymethylation. It is felt that the use of such chemically modified cottons would see extensive application in those higher priced applications which would benefit most from enhanced moisture absorption and increased moisture retention.

Although greatly limited in manpower, we at SRRC and the Cotton Textile Engineering Research Group will strive to be as active as possible in the area of cotton nonwovens, and will continue to demonstrate the benefits of natural fibers in the nonwovens industry where synthetics currently command most of the market.

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