

THE DEVELOPMENT AND MANUFACTURE OF COTTON/WOOL BLENDS, AND ITS UNTAPPED COMMERCIAL MARKETING POTENTIAL

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Abstract

Cotton/wool blends offer esthetics and benefits not currently recognized by the commercial consumer. A variety of cost and quality effective methods are available to manufacture yarns for knitted and woven cotton/wool fabrics.

Discussion

There is nothing new about cotton/wool. This concept has been around for more than fifty years, but our challenge now is to penetrate new markets, new product development and to create new excitement for the consumer.

The company with which I was associated for over twenty years made several millions of pounds of cotton/wool blends for the U. S. Military, beginning just prior to and during World War II and the Korean War. These yarns were used in winter weight knitted underwear and cushion-sole boot socks. The company was awarded the coveted Army-Navy "E" Award for Excellence, I believe, three times during World War II.

Basically there are three effective methods of blending cotton and wool, other than the so-called mechanical blending of ends of all-cotton and all-wool in twisting, knitting and weaving. We refer to these methods as intimate blending, or the homogeneous mixing of cotton and wool fibers in yarns for knitted and woven fabrics and apparel.

For good, intimately blended stock, you may first blend on the Draw Frame, using carded or combed cotton drawing sliver, blended with wool that has been either carded in 100% form or with stretch broken sliver.

Secondly, you may blend short-shorn scoured wool with cotton and introduce it directly in the feeder hopper supplying a cleaning line. If the short shorn wool is clean enough, it could be blended with cleaned cotton.

Thirdly, and only because this is the process I'm going to emphasize, you may do as we do at Meritas Yarns, by blending cotton that has been simply cleaned or even cleaned, carded and combed; and feed the stock pneumatically to a sophisticated blend line where the wool is added at the desired percentage level. In this case, the

wool is scoured, carded and combed, and has been either cut or stretch-broken to obtain the desired cut length.

Those of you in manufacturing know that you will get as many opinions as there are people asked, as to preferences in blending. Each method is suitable for a particular situation or end-use. We are convinced that intimate-blending results in a better yarn with better fiber distribution and blend uniformity. This is especially important for cross-dyeing of components with affinities to different type dyestuffs.

Retention of the desirable characteristics of each fiber is also best accomplished by intimate blending. While I did not bring them to San Diego, I have examples of intimate-blended knitted and woven apparel items in which you can quickly see that you have retained the softness and comfort of cotton, yet encompass the warmth, resilience and durability of wool.

Before we go further, let's talk a few minutes about raw materials.

For quality cotton and wool blends, you must have the best raw materials available. Wool fiber, depending on grade, can be several times the diameter of cotton, so running cotton and wool blends on the short-staple system you must attain a balance of raw material characteristics, blend level, yarn size, speeds, twist, yarn uniformity and breaking strength.

At my company we have the flexibility to run different cotton mixes, choosing cotton characteristics that are compatible with the fiber to be blended, keeping in mind both raw material costs and the desired characteristics of the finished yarn or fabric.

For instance, the cotton portion of a blend of 80% cotton/20% 64s wool, could well be a 314 or 315 with an HVI staple of 1.06, Memphis-area growth, with an average micronaire of 4.0 to 4.4. A 50/50 blend with a coarser grade of wool may require California growth or a longer staple cotton with a somewhat higher tensile strength of 28 to 30 grams per tex or higher. Possibly you may need to use a cotton with lower average micronaire in order to provide more cotton fibers per cross section, yet maintaining your nep count within your allowable limits. As with 100% cotton yarns, fluorescence and color consistency are essential for yarn-dyes and piece-dyes, especially for apparel end uses.

Selection of the proper wool is of equal, if not more importance due to the number of options available. Of course, some wool characteristics such as origin, grade, color, black hair content, shrink resistance, etc., may be specified by your customer. Sometimes this may make the decision less selective. Otherwise, not only the foregoing

characteristics, but cut length and oil, moisture and vegetable matter content must be within specified limits.

At Meritas we are purchasing both domestic territory wools and fine Australian top in grades of 56s to 70s. Normally our wools are cut 1-1/2" for blending with cotton. Shrink resistance and the method thereof may be dictated by blend level, care labeling or customer need.

Now I want to walk you through our manufacturing operation, as we would run a blend of 50% combed cotton/50% Australian Superwash 70s. During this walk-through, I will show you a few slides, taken some time ago which should make the process clearer.

A Fiber Controls Snowmaker plucks and opens the cotton mix laydown, designated for the yarn end use characteristics. Stock then goes to a Fiber Controls Blending Reserve and thence to the X-L Centrif Air Cleaner, thence to one of three Hergeth Flock-feeds supplying Hergeth Vibrachutes which regulates stock to our Saco-Lowell/Hollingsworth cards. These cards have Crosrol fronts and Crosrol Autolevelers. Each Flock-feed can be directed to supply one or two of the four lines of card. We thus have considerable flexibility with both the number of blends being carded at any one time and the capacity of a particular blend.

Cotton is carded at 50 lbs per hour and 70 grain card sliver is delivered 8 ends up to one process of Saco-Lowell Versamatic Drawing, delivering sliver to Saco-Lowell Lap Winding, thence to Saco-Lowell Combers.

Combed stock is taken off pneumatically at the Draw Box and returned to a Fiber controls Reserve Hopper, where the Combed stock is directed through distributors to two hoppers on either of two five-hopper blend lines.

I might add here that cleaned cotton could have been channeled directly from the cleaning line to these same hoppers, had a carded cotton blend been specified.

Cut wool top is fed from bales to the extended apron feed table and combed cotton stock and wool is measured out in a weight-pan system, controlled by a Diversified Engineering Microprocessor, designed for blending applications, previously programmed to the desired weights.

Each dump on every hopper is monitored 24 hours daily and, in the unlikely event of a heavy or light dump, it is automatically adjusted for on the next dump, resulting in an overall tolerance of less than one-half of one percent.

A stock conveyor transports the blend to a Fiber Controls Opening Blender, then to a blend hopper and to the designated card lines by way of the Flock-feed. By the time the stock enters the chutes, we already have a good homogeneous blend regulating stock to the feed roll of the

cards. Two drawing processes complete the blending process, with the finisher process on Hollingsworth DJ draw frames with short term autoleveling, supplying roving with 60 grain sliver that is well blended and has a low coefficient of variation.

Four 80-spindle Rovematics carry the blend to .80 Hank Roving on 5-1/2" x 12" packages.

Spinning is Saco-Lowell Spinomatic with MagneDraft drafting. We have twenty-eight 3.5" gauge spinning frames of 336 spindles per frame. Ring size is 2.25". Normally our yarns are spun from single-creel roving, however double-creeling is available for finer yarn sizes and special quality considerations.

Yarn is wound on four 50-spindle Schlafhorst 138 Autoconers equipped with Air-splicing and Peyer Optical Clearers.

The finished packages are checked for possible contamination under the black light and then run through a two hour heat and moisture conditioning cycle in an H & W oven.

Yarn packages are then individually inspected, wrapped in polyethylene and packed 45-cones per carton. Cartons are automatically weighed with gross, tare and net weights applied to each carton and put into finished goods inventory.

To better illustrate the performance of intimate blending, I want to repeat three or four slides, in which wool top is being simulated by black stock to get a better definition of each fiber.

While intimate blended cotton/wool blends have inherently less tensile strength than all-cotton or all-wool, they are quite sufficient for efficient fabric formation. In yarn manufacturing, production rates are produced to insure quality and acceptability. Once you arrive at the proper setting, speeds, temperature, humidity, etc., cotton/wool blends are really not a lot different from any other blend once a commitment is made for a set-up such as I have described.

Wool prices are volatile. There is no room for blend variation, since an error of 1 per cent can mean 4¢/5¢ or more per pound on the bottom line.

The advantages of well blended cotton/wool yarn and fabrics far outweigh the disadvantages; however, I would like to sum up some of the potential challenges you should be prepared to face in yarn manufacturing-

1. This delicate blend may require that machine speeds, especially in spinning and winding, be reduced.

2. There is not currently, nor do I expect that demand will be great enough that a cost effective block of spinning can be set-up and remain on a given blend.
3. Blend levels of greater than 15%-20% wool are probably not suitable for open-end or air-jet spinning.
4. Wool tops being purchased on a bone-dry basis, with full 15% regain added back, moisture retention and control is essential in costing your product.
5. OSHA requirements. Wool top generates matter which registers on the filter of a vertical elutriator, the device for measuring cotton dust. In my plant we are well below the OSHA minimums of 200 micrograms per cubic meter of air space; however, we have had to spend many thousands of dollars in additional filtration to ensure that we effectively meet the cotton requirements from a material from which no harmful effects are suggested. To my knowledge, there is no Permissible Exposure Level in a worsted or woolen spinning plant.

I would like to spend a few minutes on marketing problems and possible solutions.

I mentioned in my earlier comments that the U. S. Military has used intimate blended cotton/wool for many, many years. Two or three years ago, I made a similar presentation

before representatives from the U. S. Army Textile Research Facility in Natick, Massachusetts. Their development and continued usage of the various cotton/wool items is a huge endorsement in itself for this concept. We still make cotton/wool yarns for cushion-sole boot socks and ski socks, the prototypes for which go back many years.

As I see it, there is a huge untapped potential for additional cotton/wool knits and wovens for commercial use. Simply stated, no one has made the effort to effectively sell the benefits of this blend to the consuming public. No one has done, for instance, for the commercial consumer, what Natick has done for the military.

As we all know, most designers stress a look or a color not the advantages and all-year adaptability of lets say a 50/50 cotton/wool, as opposed to all-cotton, acrylic, rayon, other blends and 100% wool itself.

I challenge a recognized brand, private label, or catalog house to assign marketing and merchandising expertise to this concept and open up a whole line for many seasons duration. My company would certainly contribute to this effort.

Currently, we have cotton/wool yarns going into higher priced thermal underwear and outerwear, sweaters, high performance sport socks and activewear. Our most recent new program is a cotton/wool filling woven with an all-cotton warp for designer slacks. This promises to be a significant program. We even have cotton/wool in denim jeans.