TRC

TEXTILE TOPICS

TEXTILE RESEARCH CENTER • TEXAS TECH UNIVERSITY • LUBBOCK, TEXAS • USA

Volume XIII, No. 11
July 1985

COTTON FIBER MATURITY A meeting on cotton fiber maturity was held at the Textile Research Center in June and was attended by several persons who had previously expressed interest in this subject. This was not an open meeting where formal papers were given, but rather it was an exploratory session with the primary objective being to determine current progress in measuring cotton maturity. An additional objective was to review testing procedures and instrumentation. While we have long been interested in fiber maturity, our number one interest is developing or finding some instrument that can rapidly and accurately make this measurement. This interest has come from our findings that micronaire is not always a measure of maturity. In the Lubbock area, for example, we have found that some varieties of cotton will mature with micronaire values as low as 3.2. The cotton spinning industry has stated that for rotor spinning, and perhaps other systems, there is need for a fine, strong cotton for production of quality yarns at maximum efficiency. Therefore, we are interested in some means of distinguishing between fine immature cotton and fine mature cotton.

Because of this, we were pleased that two representatives from Technicon Industrial Systems Division attended our meeting and demonstrated a new instrument that rapidly measures cotton maturity. The Technicon representatives used a variety of cotton samples, some of which were USDA standards that had previously been tested by the causticaire method. The group watching the demonstration was pleasantly surprised at the apparent accuracy of the instrument and with the time required for the test, only about 15 seconds. When testing the USDA standards, the instrument reported virtually the same percent maturity that was given on the label accompanying the sample. The instrument was sufficiently impressive to warrant further consideration, and arrangements are being made with Technicon to obtain one for evaluation at the Textile Research Center. It was the understanding of the group that the software for making the measurement had been developed in conjunction with the Institute of Textile Technology, Charlottesville, Virginia.

Those attending the meeting were Ralph Powell, Technicon Industrial Systems, Spring, Texas; Roy W. Weedon, Technicon Industrial Systems, Tarrytown, New York; Dr. Robert Barnhardt, Institute of Textile Technology, Charlottesville, Virginia; Dr. Fred Shofner, ppm, Inc., Knoxville, Tennessee; Barbara Shaeffer and Larry Teague, Motion Control Inc., Dallas, Texas; Ed White, Spinlab, Inc., Knoxville, Tennessee; Ken Bragg, USDA - Cotton Quality Research Station, Clemson, South Carolina; Emerson Tucker, American Cotton Growers, Lubbock, Texas; James King and John A. Key, Cone Mills Corporation, Greensboro, North Carolina; Joel Hembree, Lubbock, Texas; Dr. Preston Sasser, Cotton Incorporated, Raleigh, North Carolina; John Price and Harvin Smith, Textile Research Center, Lubbock, Texas. Dr. Sasser served as moderator for the meeting.

PROCESSING WOOL ON THE COTTON SYSTEM Occasionally we have reported in *Textile Topics* the use of wool on the cotton system of spinning. The Textile Research Center has given a good bit of time to evaluating this procedure, for in the United States a high percentage of all yarn is spun on the cotton system. The woolen and worsted systems contribute a relatively small percentage of total yarn production, although the worsted system is used extensively for the production of carpet yarns. Another reason we have looked closely at using wool on the cotton system is that a percentage of the wool produced in Texas is shorn when the fiber is 1½ to 2 inches in length. This is done for various reasons, but it always results in a fiber that is shorter than normally used on the worsted system. We have learned that a good portion of the short-shorn wool can be used on the cotton system, particularly when it is blended with some other fiber. Blending is important, for the coefficient of length variation of this type of wool is

quite high and it does not process well in 100% form.

We have received a number of inquiries about wool yarns produced on the cotton system, and some have asked about the effect of this type of yarn on woven fabric appearance and quality. In a program conducted during the past year, we blended wool with cotton and used the yarn as filling in denim. This fabric was selected primarily because we have learned of some interest in having wool in designer jeans. We found this to be an interesting program, and we believe it may be of interest to our readers, also.

While wool is a comfortable fiber and absorbs moisture quite well, it does not have the strength of most other fibers. This is reflected in the data presented on the next page. It is obvious that the low strength had an effect on both the yarn and fabric, but with a small percentage of wool, such as 15% or 20%, the fabric most likely would be acceptable by many standards.

The warp for the denim produced in this program was obtained from the American Cotton Growers Textile Division at Littlefield, Texas. It was a standard 100% cotton warp used in their production of 14½-ounce denim. The filling, produced at the Textile Research Center, was blended at the beginning of processing by use of standard blending feeders. This was followed by two opening/cleaning machines, chute feeds to Hollingsworth high-speed cards, two processes of drawing, roving, and then spinning on a conventional Saco-Lowell ring spinning machine. As Table III shows, three yarns were produced, one of 100% cotton, the second using 10% wool and the third 20% wool. Properties of the cotton used in the filling are given in Table I. The quality of the wool is shown in Table II.

In studying the yarn testing results, it will be seen that the strength of the filling yarn decreased with an increase in the percentage of wool, both in count-strength-product and in tenacity expressed in grams/tex. Yarn uniformity also deteriorated as the wool was introduced, although this was not by a great amount, and the hairiness of the yarn changed as the blend moved from 100% cotton. Table IV gives results of fabric testing. Shrinkage increased in the filling direction as the percentage of wool increased. Both breaking strength and tearing strength decreased with the use of wool, although 10% wool in the blend did not affect tearing strength. Abrasion resistance declined as the filling blend went from 100% to 80% cotton.

As we stated earlier, wool is an excellent fiber in many ways. While we were not able to objectively measure such characteristics as comfort and other aesthetic qualities, we have given the physical properties of the fabric which can be measured by instruments. We appraised the fabric as being appealing in many ways and feel that a percentage of wool might be desirable in certain styles of jeans.

This review has been taken from a larger report to the Natural Fibers & Food Protein Commission of Texas. The project was supervised by John P. Goen who is responsible for our research on wool and mohair. All yarn and fabric testing was done in TRC's materials evaluation laboratory, while spinning and weaving were conducted by the staff of our processing research section.

SHORT COURSE FOR JOHNSON & JOHNSON During the week of July 1 through 5, the Textile Research Center conducted a short course in Textile Technology for a group of Johnson & Johnson managers and supervisors. The instruction included studies in fiber properties, testing and quality control, carding and spinning, chemical treatment of textile materials, and non-woven fabrics.

Participating from Johnson & Johnson were Mack V. Estes, Joyce Adams, Roxanne Bartelmey, Karen Counce, Louise Finney, Frances J. Franks, Mary Jane Moore, Patrick Rowland and Cecil W. Whitt. TRC instructors were Cecile Ingram, Harvin Smith, Edwin Foster, Richard Combs and Robert Steadman.

This is the fifth consecutive year that TRC has conducted the short course for Johnson & Johnson. We are always pleased to work with the textile industry in programs such as this.

VISITORS Other visitors to the Center during July included John Eckert, Wool Bureau, New York, NY; J. Norman Efferson, Baton Rouge, LA; George R. Muller, M. M. Robinson, Frank A. Yates and P. H. Pearson, Firestone Fibers & Textiles Company, Hopewell, VA; Raymond Jennings, West Point Foundry & Machine Co., West Point, GA; Edward A. Vaughn, Clemson University, Clemson, SC; and Robert E. Uhrig, Florida Power & Light Company, Juno Beach, FL.

Also visiting were N. J. Thomas, CSIRO Cotton Research Unit, Narrabi, Australia; Adrian Hunnings, Cotton Council International, Washington, DC; H. A. "Bob" Poteet, Texas Cotton Association, Dallas, TX;

Z. Nyerges, Rabatext, Gyor, Hungary; Judith Krauth, Pamutfonoipari Vallalat, Budapest, Hungary; Gyorgy Bakonyi, Pamuttextilmuvek, Budapest, Hungary; and Imre Barkanyi, Hungarotex, Budapest, Hungary.

In addition, several groups came to the Center, among which were Deans and Assistant Deans of Colleges of Home Economics throughout the United States, several Extension and 4-H clubs, and classes from the College of Home Economics at Texas Tech University.

TABLE I

Cotton Fiber Properties

Micronaire	3.9
2.5% Span Length (in)	1.14
Length Uniformity (%)	82.5
Elongation (%)	5.4
Grade	21

TABLE II

Wool Fiber Properties

Mean Length (in)	1.32
Mean Length CV%	32.57
Average Diameter (μm)	23.02
Average Diameter CV%	21.88
Grade	62's

TABLE III

Filling Yarn Properties

Type Yarn	100% Cotton	90% Cot/10% Wool	80% Cot/20% Wool
Nominal Yarn No. (N_e)	6/1	6/1	6/1
Actual Yarn No. (N_e)	6.13	5.80	6.02
Yarn No. Variability (CV%)	1.43	1.12	1.52
Twist Multiplier	3.50	3.50	3.50
Skein Strength (lbs)	471.3	463.0	404.8
Skein Str. Var. (CV%)	3.32	1.90	3.27
Count-Strength-Product	2892	2681	2437
CSP Variability (CV%)	2.82	2.13	3.71
Single Yarn Elongation (%)	7.95	7.79	7.42
Single Yarn Strength (g)	1639	1598	1433
Single Yarn Str. Var. (CV%)	6.62	6.56	6.56
Tenacity (g/tex)	17.61	15.70	14.61
Tenacity CV%	6.62	6.56	6.56
Uster Non-Uniformity (CV%)	13.12	13.84	13.89
Thin Places/1,000 yds	4	8	6
Thick Places/1,000 yds	34	36	32
Neps/1,000 yds	12	11	8
Hair Count/100 yds	6681	7965	7268

TABLE IV

Fabric Properties
6/1 N_e Filling Yarn

Fabric Detail	Weight (oz/yd^2)	Width (in)	Ends/ inch	Picks/ inch	Percent Shrinkage		Breaking Strength (lbs)		Elmendorf Tear (lbs)		Flex Abrasion (cycles)	
					W	F	W	F	W	F	W	F
Greige												
100% Cotton	11.70	65.00	53.6	36.0	14.67	7.13	188.00	152.11	*	14.10	3834.5	3247.2
90%C/10%W	11.98	64.25	53.8	36.0	14.80	7.27	181.40	137.10	*	14.10	4039.8	3035.0
80%C/20%W	11.80	65.12	53.8	36.0	14.63	7.40	193.10	137.80	*	13.38	3989.6	2550.0
Finished												
100% Cotton	14.30	61.62	56.2	41.0	---	---	176.10	151.70	*	*	4451.2	4901.0
90%C/10%W	14.50	61.75	56.4	41.2	---	---	171.10	151.20	*	14.10	4300.2	4554.0
80%C/20%W	14.50	61.37	57.0	41.6	---	---	180.20	142.70	*	14.06	4347.0	3635.2

*No complete tear