TRC

TEXTILE TOPICS

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

Volume XIV, No. 4
December 1985

SPINNING FINE OPEN-END YARNS -- PART II In the September issue of *Textile Topics* (Vol. XIV, No. 1), we carried information about the production of an N_e 40 100% cotton yarn at open-end spinning. We mentioned that textile manufacturers in the United States and Europe are moving to finer yarns on rotor-spinning machines, and we felt it appropriate to investigate what might be done when utilizing a properly selected cotton and the latest spinning equipment. We emphasized then, and we do so again, that this research is done without any regard for the economics of spinning fine open-end yarns. It is purely an investigation of the mechanical possibilities of utilizing rotor spinning for the production of yarns that are normally produced on ring machines.

In this phase of our study, we selected a Pima cotton that we felt was suitable for spinning fine yarns. This was used for producing N_e 40 and 50 from both carded and combed stock. We have also spun N_e 60 yarn under the same conditions, and the results of that will be carried in the next issue of *Textile Topics*. We are not sure at this point whether we will attempt finer yarns, but we do want to make this research as thorough as possible.

Fiber properties of the cotton used in this study are given in Table I. We would like to mention that all fiber testing was done on individual instruments, the strength in grams/tex being obtained from a Stelometer, and the 2.5% span length and uniformity ratio coming from testing on a Spinlab Fibrograph. The short fiber content was determined by use of a Peyer AL-101 instrument, and the non-lint content was obtained from a Shirley Analyzer. The micronaire value was the result of testing on a Motion Control Fibronaire. As can be seen, the fiber properties seem to be entirely suitable for spinning fine yarns.

TABLE I

Fiber Properties

Strength (g/tex)	31.1
Elongation (%)	5.92
2.5% Span Length (in)	1.278
Uniformity Ratio (%)	42.8
Short Fiber Content (%)	8.0
Micronaire	4.08
Non-Lint Content (%)	2.0

After processing the cotton through a conventional opening line, it was fed by a chute-feed system to our standard revolving-flat cards. Part of the stock was processed through single drawing and was then formed into laps for combing, where 15.3% noils were removed. This was followed by two additional drawings prior to spinning. The weight of the finisher sliver was reduced to 40 grains/yard. For the carded yarns, two processes of drawing followed carding, and the stock was then taken directly to spinning.

A Schlafhorst Autocoro was used for spinning all yarns. The upper portion of Table II gives the mechanical details of the machine, while the lower part presents yarn testing results. It should be noticed that the N_e 40 yarn was produced with a 4.47 twist multiplier, and the N_e 50 was spun with TMs of 4.50 and 5.00. It can be observed that the increased twist resulted in better spinning. Also, the count-strength-products of the N_e 50 yarns produced with a 5.00 twist multiplier were higher than the same yarns spun with a 4.50 TM, but this strength increase was not reflected in the single-yarn tenacity. Neither was there an improvement in the non-uniformity (CV%). The hairiness of the yarns was reduced with the extra twist, however, and in general it seems that the higher twist level was more suitable. A comparison

TABLE II

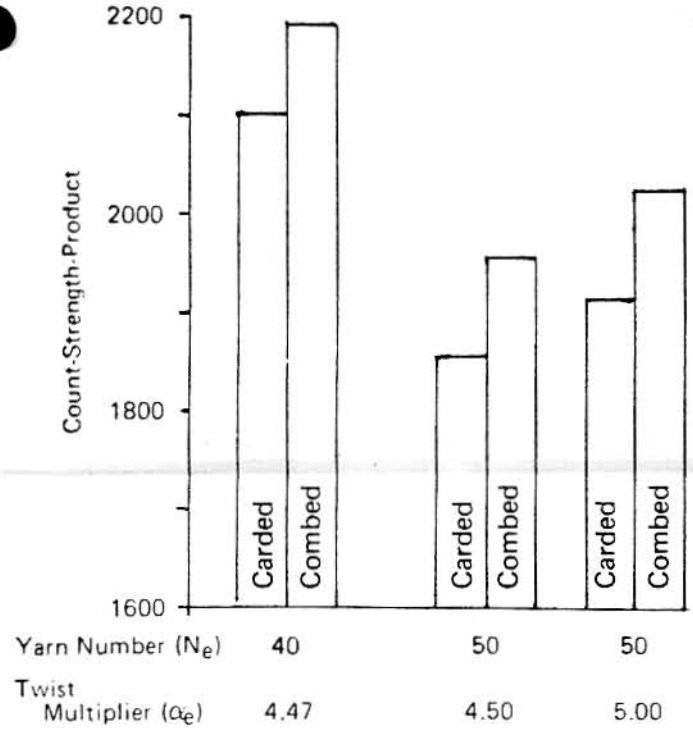
Machine Specifications and Yarn Testing Results

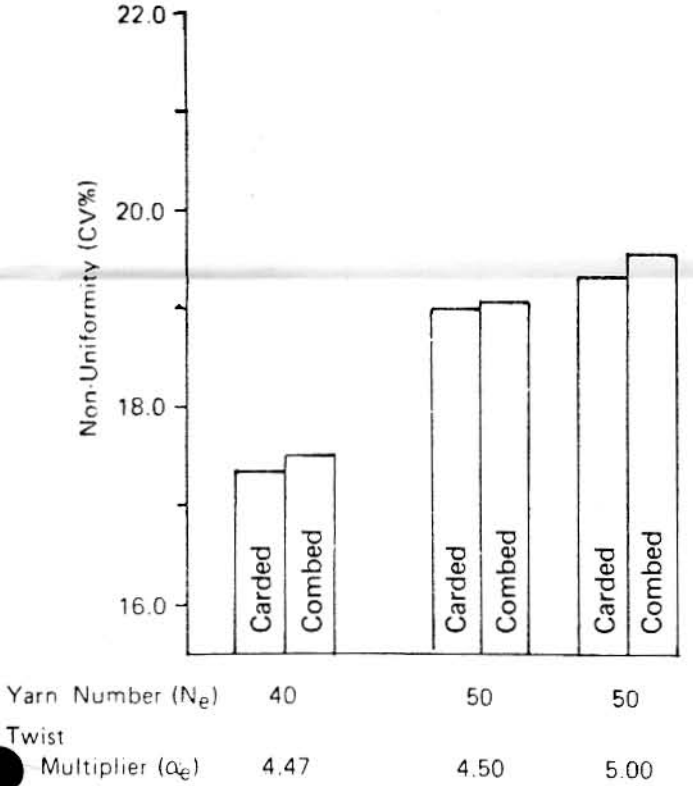
Sliver	40 gr/yd 2nd Passage Drawframe After Carding			40 gr/yd 2nd Passage Drawframe After Combing*		
Machine	Schlafhorst Autocoro					
Nominal Yarn Number (N_e)	40/1	50/1	50/1	40/1	50/1	50/1
Rotor Type	G40					
Rotor Speed (rpm)	72,000					
Opening Roller Type	OB20					
Opening Roller Speed (rpm)	7000					
Draft	191	239	239	184	228	228
Twist Multiplier (α_e)	4.47	4.50	5.00	4.47	4.50	5.00
Yarn Speed (yd/min)	70.7	63.0	56.6	70.7	63.0	56.6
Navel	KK4					
Ambient Conditions	72°F/56% RH					
Test Duration (Rotor hours)	32.5	36.5	--	32.5	36.5	--
YARN PROPERTIES						
Skein Test:						
Yarn Number (N_e)	39.54	49.25	49.05	39.37	49.00	48.73
CV% of Yarn Number	0.6	1.9	1.7	0.9	1.6	0.9
Count-Strength-Product	2101	1858	1913	2191	1959	2024
CV% of CSP	2.9	2.7	3.1	3.0	5.2	2.8
Single Yarn Tensile Test:						
Tenacity (g/tex)	14.11	14.13	14.10	15.82	15.44	14.56
Mean Strength (g)	211	169	170	237	186	177
CV% of Strength	8.6	9.2	10.5	8.4	10.6	11.6
Elongation (%)	5.35	5.25	5.00	5.44	5.59	4.88
CV% of Elongation	8.2	8.8	11.2	8.1	9.4	13.3
Specific Work of Rupture (g/tex)	0.385	0.375	0.371	0.431	0.423	0.373
CV% of Work of Rupture	14.7	16.0	18.8	14.9	17.6	22.3
Initial Modulus (g/tex)	368	371	392	373	392	405
Uster Evenness Test:						
Non-Uniformity (CV%)	17.32	19.00	19.34	17.50	19.07	19.59
Thin Places/1,000 yds	151	374	366	166	390	467
Thick Places/1,000 yds	331	528	571	358	556	704
Neps/1,000 yds	1060	1526	1662	808	1274	1488
Hairs/100 yds	210	148	117	315	205	142
Performance:						
Number of Breaks	8	21	0	2	8	1
Break Rate/1,000 Rotor hours	246	576	--	61.6	219	--

*Noils Removed in Combing = 15.3%

of the count-strength-products and non-uniformity (CV%) of the carded and combed yarns is shown graphically in the bar charts on page 3.

Several TRC staff members were involved in this program, and we would like to give credit to them for their contributions. Processing through combing and drawing was carried out in our mechanical processing department under the direction of Edwin R. Foster, assisted by Mack Holcomb and Ramon Ortiz. The spinning was supervised by John B. Price, who was assisted by William D. Cole and Albert Esquibel. All fiber and yarn testing was conducted in our materials evaluation laboratory. This is directed





by Harvin Smith with the assistance of Pauline Williams and a number of technicians in that department.

This research is being sponsored by the Natural Fibers and Food Protein Commission of Texas. We wish to thank that agency for its support.

COTTON FIBER MATURITY In the August 1985 issue of *Textile Topics* (Volume XIII, No. 12), we mentioned our continuing interest in cotton fiber maturity. We have had a number of inquiries about our research on this and about the possibility of our obtaining another instrument for making maturity measurements. For some years we have been using the IIC/Shirley Fineness/Maturity Tester, and the results obtained from this have been most helpful in our studies. The other instrument we have wanted for additional tests is the InfraAlyzer 400 manufactured by the Technicon Industrials Systems, Division of Technicon Instrument Corporation.

We have recently learned that the InfraAlyzer 400 will be delivered to the Textile Research Center soon after the first of the year. This will be used to generate data and contribute to the base we have already established on identifying mature cottons. Also, tests will be made to determine the relationship with micronaire. We have known for some time that certain fine-fibered cottons mature at low micronaire values, and we hope our future investigations will identify these. We are pleased that we will soon have the InfraAlyzer 400. We will carry information about this instrument in future issues of *Topics* so that our readers can be informed of our activities and findings.

NEW FACILITIES FOR TRC In last month's *Textile Topics* we reported that the Textile Research Center has been assigned new and larger facilities. We stated that Texas Tech University had acquired a modern

industrial building and has decided to place the Center in this, after it has been renovated to meet TRC's needs. We have just learned that the renovation will begin early in January and will likely continue for most of 1986. We look forward to beginning operation in the new building near the first of 1987.

The process of relocating all of our equipment to another facility some six or seven miles away certainly will not be without problems, but we will attempt to make the transition with a minimum of down time. Current plans are to keep our research active by continuing operations in the present location while part of the machinery and equipment is being transferred to the new building. By doing this, we hope no single department will be stopped for more than a short time. We still have approximately one year before the move begins, and we will mention this from time to time to keep you informed of the progress that is being made.

VISITORS Visitors to the Textile Research Center during December included Michele Woodruff and Dean Pelzer, Cotton Incorporated, Raleigh, NC; Roger Bolick, Allied Plastics & Fibers, Hopewell, VA; Graham Webster, Milliken Chemicals, Inman, SC; Scott Gessner, Ed Knickerbocker and Allen Guy, Dow Chemical Company, Freeport, TX; William A. Caviness and Jimmy E. Moody, Hadley-Peoples Manufacturing Co., Siler City, NC; Willis and Howell Newton, Trio Manufacturing Co., Forsyth, GA; B. L. Rutledge, II, Clemson University, Clemson, SC; and Masayuki Onoue, Industrial Research Institute of Kanagawa Prefecture, Yokohama, Japan.

Also, approximately 120 students toured the Center during the first part of December. These included classes from Monterey High School, Lubbock, TX; Texas A&I University, Kingsville, TX; and Texas Tech University.