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ROTOR SPINNING OF AMERICAN COTTONS During 1987, the International Center for Textile Research and Development conducted a program to evaluate the rotor spinning performance of cottons from four production areas in the United States. A report on this study was given by John B. Price, assistant director of the Center, at the symposium on Recent Developments in Cotton Fiber Testing and Spinning Technology held in Lubbock on November 17 & 18, 1987. Also, a printed report was prepared by Price, who directed the entire program.

This study was sponsored by W. Schlafhorst & Company of Monchengladbach, West Germany, and the American Schlafhorst Company, Charlotte, North Carolina. Because the written report had only a limited printing and distribution, we requested and received permission from the American Schlafhorst Company to carry it in *Textile Topics*. We will not be able to present it in a single edition, however, but will serialize it in successive issues. We promise this will be given in its entirety, even though it may take several editions to do so.

We found this to be an interesting program. We believe our readers will agree with us when they have studied the report which begins below.

THE SUITABILITY OF CERTAIN AMERICAN COTTONS FOR THE PRODUCTION OF FINE COUNT ROTOR–SPUN YARNS

1. INTRODUCTION

In late 1986 and early 1987, W. Schlafhorst & Company and the American Schlafhorst Company jointly sponsored a research project at the Textile Research Center of Texas Tech University, Lubbock, Texas. The purpose of this study was to quantify the rotor spinning performance and resultant yarn properties of cottons obtained from four major growing areas in the United States. The yarns to be produced were fine by rotor-spinning standards and were to be designed with weaving applications in mind. The count range was to be N_e 30 to N_e 40 from carded stock.

The information generated was intended to identify the following:

- the spinning specifications yielding optimum yarn properties and good spinning performances,
- the causes of spinning interruptions and possibly means of improving spinning performance,
- direction for the improvement of fiber and yarn quality, and
- criteria for designing cotton mixes.

The following is a compendium of the results obtained from the various phases of extensive evaluations. Publication of these data is made by kind permission of the research sponsors. More detailed data and background information will be available from the International Center for Textile Research and Development upon request.

2. COTTON PROCUREMENT AND PROPERTIES

Three bales of cotton were obtained from each area of growth:

Arizona (Pima); California (San Joaquin Valley); Mississippi (Delta); Texas (High Plains).

The fiber properties of these cottons were chosen to be similar to each other, yet typical and representative of their region. In particular, the cottons from California and Mississippi were of micronaire value in the premium range, i.e. about 4.2, with staples of about 36 and 35 respectively. The Texas cotton was of lower micronaire value (about 3.5), with staple of about 33. All cottons were of good grade.

Samples from each bale were thoroughly tested for all properties on.

(a) individual instruments, (b) Motion Control HVI 3000 Line, (c) Spinlab HVT Line.

Figures 1a and 1b represent the most important results of fiber testing on individual instruments. Figure 2 shows the test results on the Shirley Trash Separator, and Figure 3 lists the opening and card waste data.

FIGURE 1a

FIBER PROPERTIES MEASURED BY INDIVIDUAL INSTRUMENTS (I)

Source	Bale Number	Tenacity (g/tex)	Elongation (%)	Length (in)	Uniformity Ratio (%)	Short Fiber Content (%)	Micronaire	Pressley (MPSI)	Non -Lint Content
Texas	1843	24.77	6.25	1.028	45.2	6.43	3.50	91.7	2.27
	1844	24.18	6.90	0.995	42.7	10.00	3.37	91.3	2.68
	1845	24.48	7.38	1.000	44.8	4.42	3.60	89.0	1.80
	Mean	24.48	6.84	1.008	44.2	6.95	3.49	90.7	2.25
Delta	1846	24.13	6.50	1.108	43.3	7.05	4.23	87.2	1.63
	1847	24.52	5.78	1.097	43.2	6.25	3.97	91.6	1.41
	1848	24.72	5.78	1.088	42.7	9.50	4.27	92.8	1.41
	Mean	24.46	6.02	1.098	43.1	7.60	4.16	90.5	1.48
Pima (Ariz)	1849	36.56	6.37	1.383	45.4	2.20	4.13	108.2	2.22
	1850	36.53	6.32	1.330	47.7	1.48	4.07	106.3	2.72
	1851	35.39	6.22	1.360	44.3	4.05	4.07	106.1	2.74
	Mean	36.16	6.30	1.358	45.8	2.58	4.09	106.9	2.56
Cali-fornia	1852	30.14	5.13	1.142	43.8	5.82	3.80	105.4	0.67
	1853	26.70	5.32	1.150	45.8	3.12	4.53	95.2	1.38
	1854	27.42	5.73	1.162	47.9	0.42	4.20	99.2	1.18
	Mean	28.09	5.39	1.151	45.8	3.12	4.18	99.3	1.08

FIGURE 1b

FIBER PROPERTIES MEASURED BY INDIVIDUAL INSTRUMENTS (II)

Source	Bale Number	U.Q.L. (in)	Mean (in)	CV (%)	Short Fiber Content (%)	Mic	Mat (%)	Fin (mtex)
Texas	1843	0.99	0.77	36.1	20.5	3.7	76.9	155
	1844	0.98	0.77	35.6	20.2	3.6	72.9	157
	1845	0.94	0.75	34.2	20.7	3.8	76.0	163
	Mean	0.970	0.763	35.3	20.5	3.70	75.3	158
Delta	1846	1.11	0.88	35.0	14.9	4.4	83.2	177
	1847	1.06	0.82	37.4	19.6	4.1	85.5	160
	1848	1.11	0.90	30.8	10.4	4.4	87.4	168
	Mean	1.093	0.867	34.4	15.0	4.30	85.4	168
Pima (Ariz)	1849	1.30	1.07	29.2	5.8	3.9	91.9	140
	1850	1.34	1.13	26.1	4.1	4.1	92.9	144
	1851	1.37	1.14	28.5	5.7	4.0	94.9	138
	Mean	1.337	1.113	27.9	5.2	4.00	93.2	141
California	1852	1.13	0.89	35.1	14.6	3.9	88.4	147
	1853	1.14	0.91	34.0	12.8	4.6	87.4	178
	1854	1.12	0.91	31.1	10.9	4.3	91.6	156
	Mean	1.130	0.903	33.4	12.8	4.27	89.1	160

FIGURE 2

SHIRLEY TRASH SEPARATOR TEST RESULTS (WSC)

Sample	Origin	WSC data					TRC
		Lint Content (%)	Trash Content (%)	Filter (50 μ) Dust (%)	Invisible Loss (%)	Total Non-Lint (%)	Non-Lint Content (%)
Bale	California	98.78	0.85	0.18	0.19	1.22	1.08
	Delta	98.69	0.91	0.19	0.21	1.31	1.48
	Pima	97.79	1.78	0.28	0.15	2.21	2.56
	Texas	97.88	1.60	0.31	0.21	2.12	2.25
Sliver	California	99.70	0.09	0.12	0.09	0.30	--
	Delta	99.69	0.07	0.15	0.09	0.31	--
	Pima	99.73	0.07	0.19	0.01	0.27	--
	Texas	99.69	0.17	0.12	0.02	0.31	--

FIGURE 3

OPENING AND CARD WASTE DATA

California	4.58%
Delta	4.53%
Pima	4.51%
Texas	5.02%

The tabulated fiber properties show that the desired characteristics from each region were obtained. The Pima cotton was strongest, longest, finest, and most mature of all the cottons. The Delta and Texas cottons were of similar properties although the high-volume instrument test line data tended to assign higher values of strength to the Texas cotton. The Texas cotton was least mature of all, but the fiber fineness was similar to that of the California cotton. Although of similar micronaire value, the Delta cotton was slightly coarser and less mature than the California cotton.

Trash content measurements suggested that the California cotton was the cleanest, whereas the Pima cotton tended to be the dirtiest. There was acceptably good agreement between testing laboratories in terms of non-lint content.

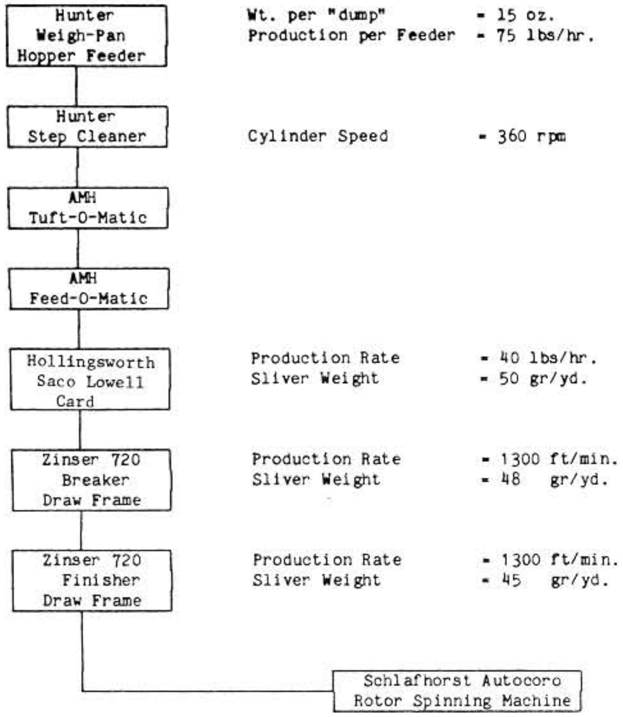


FIGURE 4: OUTLINE OF MECHANICAL PROCESSES

3. SLIVER PREPARATION

Cotton from all three bales was blended, opened, and cleaned with the sequence of preparatory processes shown in Figure 4.

4. SPINNING PARAMETERS

Yarn spinning was performed using a Schlafhorst AUTOCORO Model SRKP rotor spinning machine equipped with 24 spinning units. Sliver from each lot was randomly assigned to a block of six rotors with Pima, Delta, California, and Texas cotton respectively.

In order to establish basic spinning specifications, preliminary trials were conducted.

- studying the influence of opening roller speeds,
- studying the effect of navel position on faceplates,
- studying the influence of twist, and
- studying the influence of rotor size and rotor speeds.

All three yarns, N_e 30, 35, and 40, were produced under each set of conditions.

From the multitude of graphs developed, only two typical examples are shown below, with Figure 5

FIGURE 5: INFLUENCE OF TWIST MULTIPLIER (Texas Cotton)

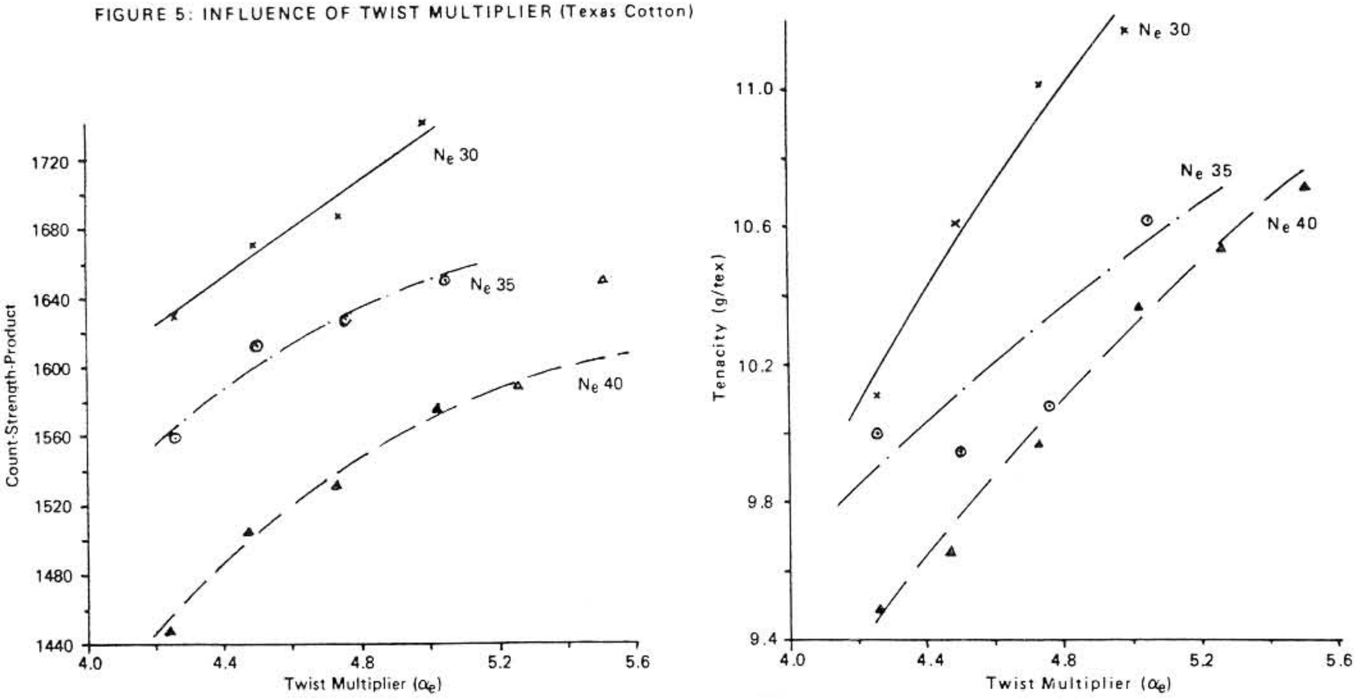
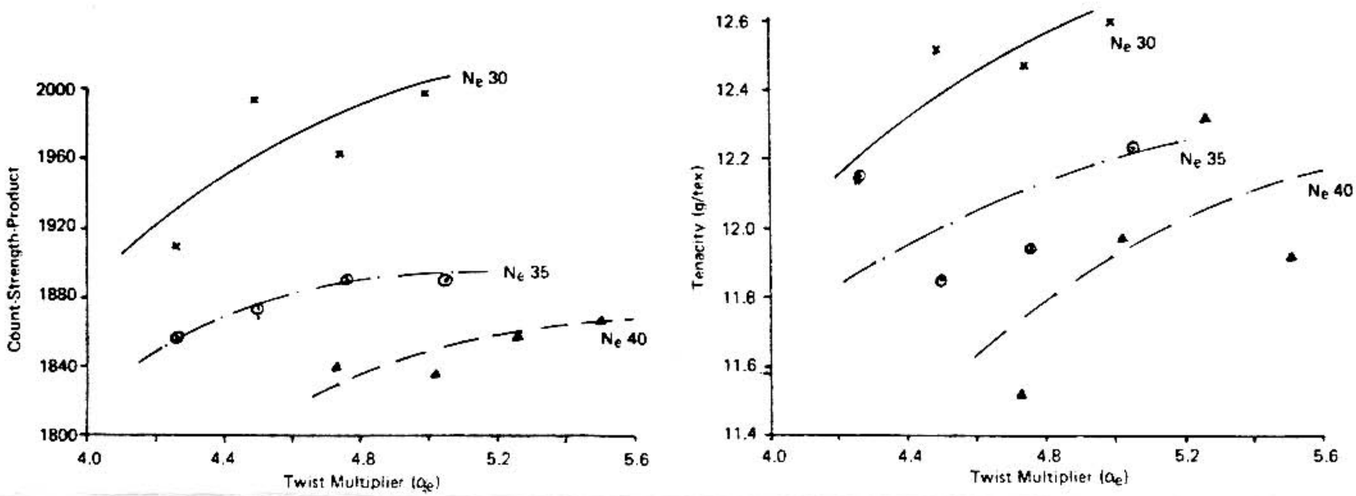


FIGURE 6: INFLUENCE OF TWIST MULTIPLIER (California Cotton)



illustrating the influence of twist on the yarn strength (Count-Strength-Product and single yarn tenacity) in the case of Texas cotton and Figure 6 illustrating this influence in the case of California cotton.

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We have presented the first installment of this report. The remainder will be given in subsequent issues of *Textile Topics*.

VISITORS We have noticed in the past that our friends apparently like to stay close to home during the holiday season; at least we surmise that is the reason for the decrease in the number of visitors to the Center during December. Those who did visit included F. S. Wiggins and H. Duane Littlefield, Allied Fibers, Columbia, SC; Susan Kerr, Allied Fibers, Petersburg, VA; Roger Bolick, Allied Fibers, Hopewell, VA; E. B. Langley and Ansel Owen, John D. Hollingsworth on Wheels, Inc., Greenville, SC; Carl Cox, Natural Fibers & Food Protein Commission of Texas, Dallas, TX; and Roberto Manuffetti, Manifattura di Legnano, Legnano, Italy.