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OPEN-END SPINNING RESEARCH: INFLUENCE OF ROTOR GROOVE DIMENSIONS Research conducted at the Textile Research Center in 1981 evaluated the spinning performance and yarn quality obtained when utilizing the Platt Saco Lowell T.883 rotor spinning machine equipped with the "side-feed" spinbox (*Textile Topics*, Vol. IX, Nos. 11 & 12 and Vol. X, Nos. 1 & 2). It was learned that the tensile strength and uniformity of the resulting yarns improved (over the original separator-feed unit) to such an extent that significant increases in production were feasible. Trials in that study were conducted using a "medium-groove" rotor only. To contribute further to the evaluation of the side-feed unit, Platt Saco Lowell provided the Center with two other designs of a commercially available rotor, referred to as "narrow-groove" and "wide-groove."

The project on which we are reporting in this issue of *Textile Topics* was initiated to characterize the performance of the three types of rotors. We were primarily interested in the quality of yarn produced by each, spinning performance, and the ability of the rotor design to support spinning at low twist levels.

Fiber properties of the cotton used in this study are given in Table I. This material was processed into 55 grain/yard sliver at finisher drawing. Five yarn numbers were spun, each with twist multipliers ranging from 4.6 to 5.4. The change in twist multiplier was in increments of about 0.2. This arrangement generated a considerable amount of data which, unfortunately, is more than can be carried in *Topics*. We are, however, including results of spinning two yarns, N_e 10 and 22 (see Tables II and III, next page). Other yarns spun were N_e 6, 16 and 30. Anyone caring to have results of the yarns not reported here can obtain them by contacting the Textile Research Center at the address shown on the back page of *Textile Topics*.

TABLE I

Length (UHM)(in)	1.02
Uniformity (%)	79
Micronaire	3.5
Strength (g/tex)	25.0
Elongation (%)	5.9
Leaf Index	33.3
Color	35.2
Grayness	31.9

While investigating the influence of these new rotors, it was found that spinning was more stable at lower twist levels when the wide-groove rotor was used, and the tensile strength of all yarns tended to increase with increasing twist levels. Additionally, it was learned that the strongest yarns, which also had the highest elongation at break, were produced by the narrow-groove rotor. Use of the wide-groove rotor resulted in the lowest strength yarns. Also, yarns produced from the wide-groove rotor had the lowest elongation at break, possessed the greatest irregularity, and gave the highest hair count. It is interesting to note that while the yarn produced on the narrow-groove rotor was noticeably stronger at the higher twist multipliers, strength of the yarn produced with a medium-groove rotor approached and eventually exceeded that made with the narrow-groove as twist levels were lowered. Additionally, it was found that the tensile strength of the yarn did not deteriorate with time when using the medium-groove rotor, as was the case with the wide-groove rotor.

When the spinning was completed and all yarns thoroughly tested, several observations were made. These were:

1. It was found that for the range of yarn numbers spun, the narrow-groove rotor produced the strongest yarn, the best uniformity and the least hairiness.
2. There was no evidence that the twist multiplier for maximum yarn strength varied with the shape of the rotor profile.
3. As the rotor groove became wider, the rate at which yarn strength decreased with increasing yarn

number also appeared to increase.

4. The radius at the base of the groove appeared to alter the rate of increase in yarn strength with increasing twist multiplier. A small radius produced a greater change in yarn strength than a large radius.
5. Between rotors of similar radius of curvature at the bottom of the groove, there was little difference in the range of twist multiplier which could be utilized.

We realize that not all *Textile Topics* recipients utilize the Platt Saco Lowell T.883 open-end spinning machine, but we feel this information on rotor groove dimensions will be of interest and possibly some value. This investigation was conducted at the Textile Research Center by John B. Price, head of open-end spinning research, with assistance from William D. Cole and Albert Esquibel. It was sponsored by the Natural Fibers & Food Protein Commission of Texas.

VISITORS Visitors to the Textile Research Center during June included J. Michael Grimes, Willow Tree Looms, Shawnee Mission, KS; Keith Hutson, Proform, Seguin, TX; Robert Ellison and Jim Campbell, General Dynamics, Fort Worth, TX; Harry Hartley, Exxon Chemical Corp. of America, Atlanta, GA; John Ashworth, Exxon Chemical Corp. of America, Summerville, SC; Rodger L. Wesson, Robert Rolston, Anne Dolan and Rita Kourlis, American Sheep Producer's Council, Inc., Denver, CO; Karl K. Mueller, American Sheep Producer's Council, Inc., New York, NY; Ed Konop, Texas Instruments, Inc., Austin, TX; Charles L. Watkins, Texas Instruments, Inc., Dallas, TX; Fernando D. Guesalaga, Empresas Texteis Santista, Sao Paulo, Brazil; Rustom M. Y. Ho, Taiwan Yu Foong Cotton Spinning Mill Co., Ltd., Taipei, Taiwan; and James Ho, Vancouver, British Columbia, Canada.

TABLE II

Properties of N_e 10 Yarns -- Platt T.883 Rotor-Spinning Machine (Side-Feed)

Spinning Specifications															
Rotor Speed (rpm)	55,000														
Opening Roller Type	Pinned														
Opening Roller Speed (rpm)	5800														
Navel	Smooth														
Rotor Groove	Narrow					Medium					Wide				
Twist Multiplier	4.62	4.83	4.95	5.10	5.30	4.62	4.83	4.95	5.10	5.30	4.62	4.83	4.95	5.10	5.30
Yarn Properties															
Skein Test:															
Actual Yarn Number (N_e)	9.95	9.94	9.93	9.94	9.93	9.95	9.94	9.94	9.94	9.96	9.99	9.99	10.08	9.97	10.06
CV% of Yarn No.	1.3	1.5	1.6	1.4	1.4	0.8	1.0	0.9	0.8	0.8	0.6	0.4	3.5	0.6	1.0
Count-Strength-Product	2230	2246	2278	2286	2310	2155	2225	2207	2212	2230	2158	2096	2146	2150	2126
CV% of CSP	1.5	1.5	2.1	3.5	1.3	1.5	1.5	2.3	2.8	3.1	1.7	2.0	3.6	1.2	2.1
Single Yarn Tensile Test:															
Tenacity (g/tex)	13.30	13.54	13.35	13.54	13.66	13.11	13.00	13.31	13.11	13.24	12.60	12.92	12.87	12.72	12.89
Mean Strength (g)	785	819	795	809	809	779	779	792	777	767	732	767	772	747	770
CV% of Strength	6.6	7.2	6.3	7.0	8.2	6.4	7.6	6.6	6.9	7.0	7.8	6.9	6.3	7.0	5.8
Elongation (%)	8.7	9.1	8.8	9.0	9.0	8.5	8.5	8.7	8.7	8.7	8.2	8.4	8.6	8.6	8.5
Uster Evenness Test:															
Non-Uniformity (CV%)	14.07	13.91	13.77	13.80	13.72	14.69	14.61	14.24	14.18	14.10	14.88	14.72	14.67	14.48	14.43
Thin Places/1,000 yds	4	0	0	0	0	12	7	5	0	1	8	5	1	1	3
Thick Places/1,000 yds	21	17	23	15	23	41	40	29	23	37	47	59	32	60	44
Neps/1,000 yds	8	5	8	11	3	33	27	28	17	21	61	69	53	45	45
Hairs/100 yds	292	284	238	215	178	360	317	287	263	230	493	455	399	359	312

TABLE III

Properties of N_e 22 Yarns — Platt T.883 Rotor-Spinning Machine (Side-Feed)

Spinning Specifications															
Rotor Speed (rpm)	55,000														
Opening Roller Type	Pinned														
Opening Roller Speed (rpm)	5800														
Navel	Smooth														
Rotor Groove	Narrow					Medium					Wide				
Twist Multiplier	4.62	4.85	4.97	5.20	5.42	4.62	4.85	4.97	5.20	5.42	4.62	4.85	4.97	5.20	5.42
Yarn Properties															
Skein Test:															
Actual Yarn Number (N_e)	21.84	21.98	21.92	22.03	21.98	21.75	21.88	21.82	21.80	21.70	22.01	22.06	22.06	22.04	22.03
CV% of Yarn No.	1.4	1.5	1.5	1.7	1.7	0.9	0.8	0.6	1.0	1.2	1.2	0.9	1.2	0.7	1.4
Count-Strength-Product	1851	1873	1925	1939	1932	1750	1766	1796	1830	1842	1668	1661	1704	1705	1699
CV% of CSP	1.3	3.1	3.7	2.7	2.5	2.2	2.4	2.1	2.1	2.8	1.6	2.8	1.6	2.3	2.8
Single Yarn Tensile Test:															
Tenacity (g/tex)	11.47	11.83	11.92	11.93	12.28	11.20	11.19	11.23	11.48	11.54	10.48	10.58	10.80	11.08	10.92
Mean Strength (g)	314	322	319	322	321	303	300	312	313	312	278	286	293	300	299
CV% of Strength	8.4	7.5	7.8	8.5	7.9	8.8	8.0	8.7	8.0	7.5	9.5	9.2	8.7	7.9	9.5
Elongation (%)	6.6	6.8	6.7	7.0	7.1	6.5	6.4	6.7	6.8	7.1	6.5	6.4	6.5	6.7	6.7
Uster Evenness Test:															
Non-Uniformity (CV%)	15.52	15.50	15.43	15.31	15.29	15.76	15.76	15.85	15.68	15.43	16.51	16.40	16.60	16.44	16.26
Thin Places/1,000 yds	27	27	21	23	21	24	37	31	29	20	60	71	55	55	57
Thick Places/1,000 yds	67	67	55	52	55	80	79	92	91	68	140	123	133	123	123
Neps/1,000 yds	104	92	92	97	76	179	159	131	172	119	268	281	285	247	292
Hairs/100 yds	123	92	108	72	68	144	115	99	80	72	198	159	155	132	113