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RESEARCH ON TANDEM CARDING: Part II

This issue of *Textile Topics* continues the serialization of our report on tandem carding. As mentioned in last month's issue, the report is too lengthy to be published at one time, and we will therefore present it sequentially. We continue with discussion of sliver preparation.

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3. Sliver Preparation (continued)

Samples of the finisher drawframe sliver were tested with the Peyer AL-101 instrument to provide fiber length distribution data. The results are presented below in Figure IV.

They show that there was a tendency for Tandem carding to produce a reduction in the upper length statistic of the fibers. Only in the case of the Mark 1 Tandem card was the coefficient of length variation (hence short fiber content) increased over that of the single-carded stock.

FIGURE IV

DISTRIBUTION DATA FOR FIBER LENGTH IN SLIVER SAMPLES (Weight-biassed)

Source of Cotton	Card	Length		Coefficient of Length Variation (%)	Short Fiber Content (%)
		Upper Quartile (inches)	Mean (inches)		
California	Single	1.15	0.91	33.5	11.6
	Mk 1 Tandem	1.15	0.93	32.1	9.1
	Mk 4 Tandem	1.16	0.93	31.4	8.7
Delta	Single	1.11	0.87	35.0	14.2
	Mk 1 Tandem	1.06	0.83	36.7	18.0
	Mk 4 Tandem	1.09	0.87	33.9	13.5
Pima	Single	1.34	1.04	37.4	11.9
	Mk 1 Tandem	1.33	1.02	38.7	12.7
	Mk 4 Tandem	1.34	1.04	35.7	10.5
Texas	Single	1.00	0.80	33.6	16.2
	Mk 1 Tandem	0.94	0.74	38.0	22.8
	Mk 4 Tandem	0.98	0.78	34.7	18.1
Average	Single	1.15	0.905	34.9	13.5
	Mk 1 Tandem	1.12	0.880	36.4	15.7
	Mk 4 Tandem	1.14	0.905	33.9	12.7

4. Yarn Production

Spinning was conducted on a Schlafhorst Autocoro rotor spinning machine equipped with twenty-four (24) rotors. The specifications, tabulated in Figure V [at bottom left on this page] and derived from an earlier series of spinning trials, show that all cottons except Pima were spun at 90,000 rpm. The Pima cotton was spun at 100,000 rpm.

The twist multiplier varied according to the linear density of yarn spun, increasing in magnitude as the yarns became finer. The general level of twist multiplier (α_e) was 5.1 (α_{tex} 4880) suitable, therefore, for weaving yarns.

For all preparations of cotton, N_e 30, 35 and 40 (19.7, 16.9 and 14.8 tex, respectively) were spun for two hundred rotor hours. During the period of production, the piecing unit was not allowed to

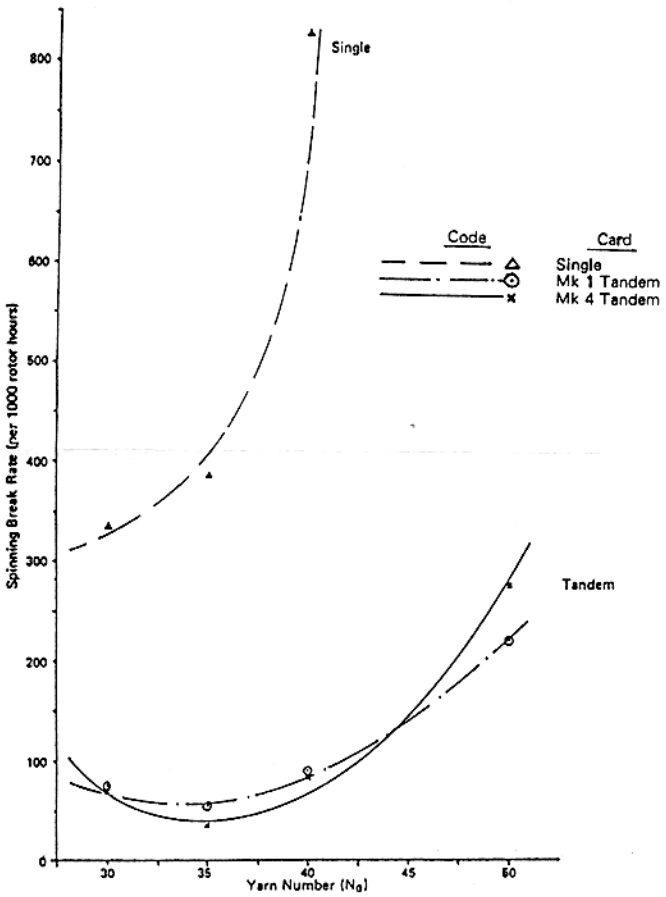
FIGURE V

SPINNING SPECIFICATIONS

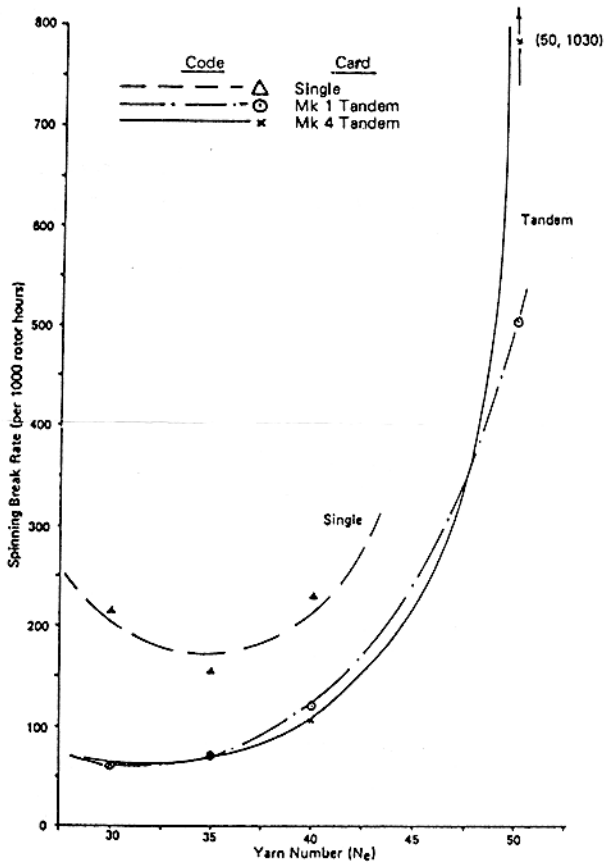
Type of Cotton	California, Delta; Texas				Pima			
Yarn Count (N_e)	30	35	40	50	30	35	40	50
Rotor type	T33 D				T33 D			
Rotor speed (rpm)	90,000				100,000			
Opening roll type	OB20				OB20			
Opening roll speed (rpm)	7,000				7,000			
Navel	KN4 + 1.5/TS				KN4 + 1.5/TS			
Twist multiplier (α_e)	4.9	5.0	5.2	5.3	4.9	5.0	5.2	5.3
Yarn speed (yd/min)	93	84	76	66	103	93	84	74

FIGURE VI

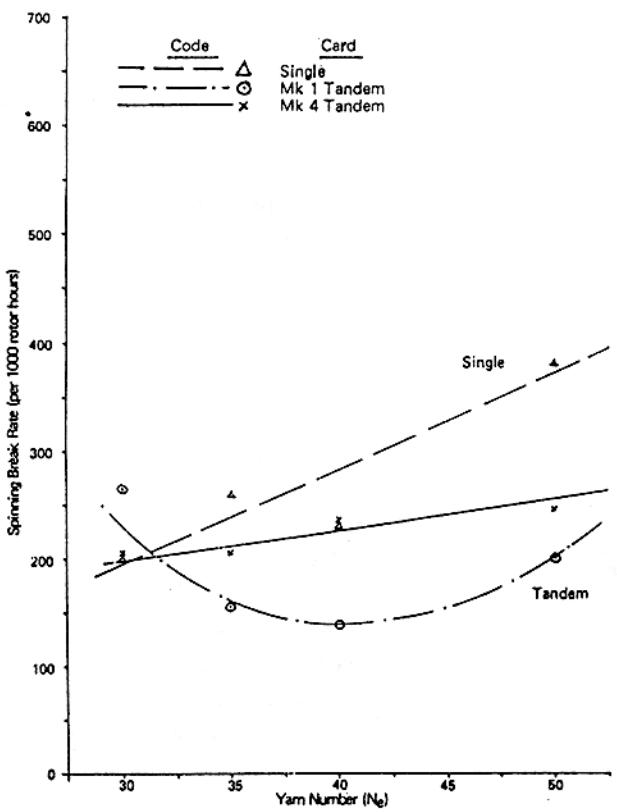
GRAPH I: INFLUENCE OF YARN COUNT ON SPINNING BREAK RATE FOR DIFFERENTLY CARDED CALIFORNIA COTTON



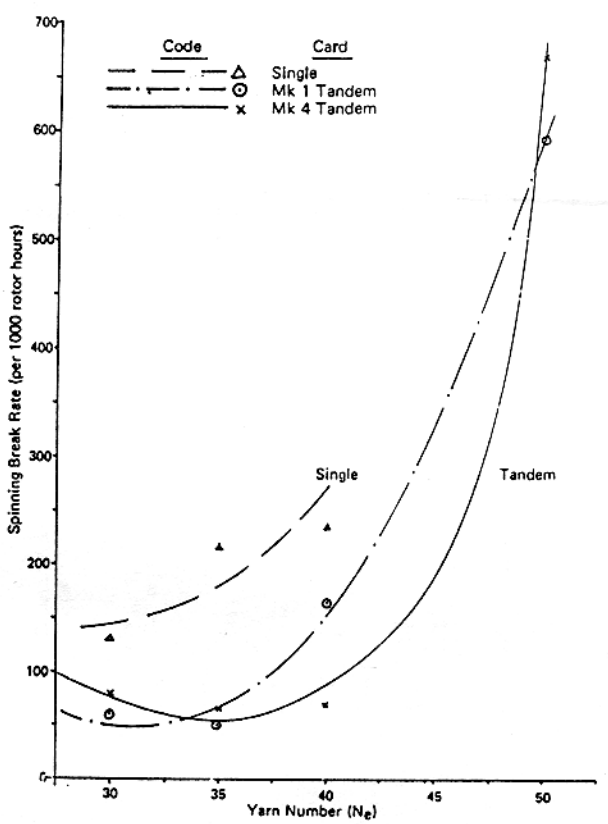
GRAPH II: INFLUENCE OF YARN COUNT ON SPINNING BREAK RATE FOR DIFFERENTLY CARDED DELTA COTTON



GRAPH III: INFLUENCE OF YARN COUNT ON SPINNING BREAK RATE FOR DIFFERENTLY CARDED PIMA COTTON



GRAPH IV: INFLUENCE OF YARN COUNT ON SPINNING BREAK RATE FOR DIFFERENTLY CARDED TEXAS COTTON



rove freely, but was only activated to restart spinning after the likely cause of the interruption to spinning had been identified by visual inspection. A record of the number and nature of the spinning breaks was maintained.

If the breakage rate experienced when spinning N_e 40 (14.8 tex) was relatively low, then an attempt was made to spin N_e 50 (11.8 tex). If the breakage rate was clearly excessive, then production of the N_e 50 was prematurely curtailed.

Prior to commencing the monitored production of yarn, a sample of about 1600 yards of yarn was spun from each of ten rotors to provide material for testing, to characterize the product from clean rotors. At the end of spinning, the packages of yarn from the same ten rotors were submitted for testing to indicate the properties of yarn from dirtier rotors.

5. Results and Analysis

5.1. Spinning Performance

Figure VI [at left] shows four graphs which depict the general trends observed in spinning breakage rate with changes in yarn count, for each of the four cottons in turn. (Spinning breaks are those which were associated with the fiber or its natural contamination.) The graphs show that, with only one slight exception, the breakage rate experienced when spinning from single-carded stock was always greater than those experienced with Tandem-carded stocks. Other than for Pima cotton, it was judged to be unrealistic to spin finer than N_e 40 (14.8 tex) from single-carded stock. The improvement in performance wrought by Tandem carding would permit production of yarn which was about 20% finer than that feasible from single-carded stock.

The trends shown by the graphs indicate that there was little difference in the spinning performance of the two Tandem-carded stocks. N_e 50 (11.8 tex) was spun from all such material, although excessive breakage rates were incurred when spinning from the shorter Delta and Texas cottons. It is most likely that the spinning limit for these cottons had been exceeded.

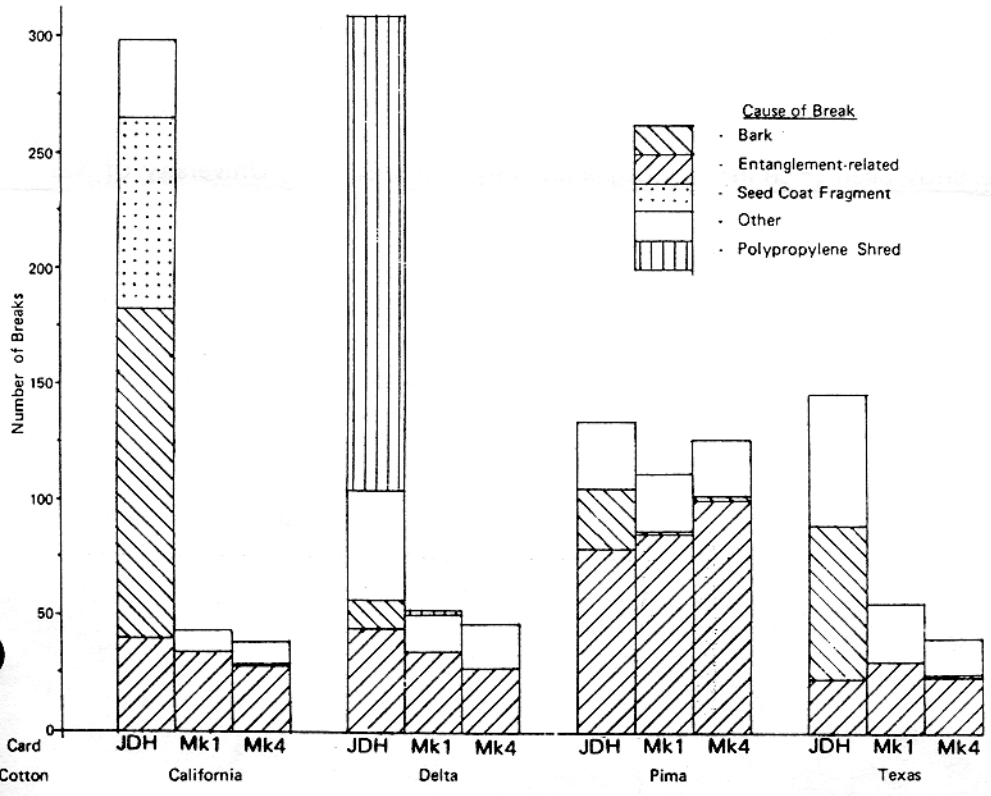
Figure VII is a histogram of the number of breaks which occurred in the production of the three yarns (N_e 30, 35 and 40) from each of the three carding treatments applied to the four cottons. It shows that the California cotton gave the highest number of spinning breaks when yarn was produced from single-carded stock, followed by Texas cotton, Pima cotton and finally Delta cotton. After Tandem carding, Pima cotton was found to be worse than the other cottons which were fairly similar in performance. It should be recalled, however, that the Pima cotton was spun under far more exacting conditions.

The histogram shows that the prime reason for the poor performance of the California cotton lay in the high number of breaks involving trash, particularly seed coat fragments and bark. Such trash-related breaks were reduced to an insignificant number by Tandem carding. Effective removal of bark by Tandem carding was also demonstrated in the data from the other three cottons.

The experiences with the Delta cotton were a special case. Although the breakage rate from spinning causes was relatively low, the actual number of breaks was very high. Foreign material, in this case shreds of polypropylene bale bagging, was responsible for twice the number attributed to purely spinning reasons. Tandem carding reduced their number to almost zero.

The number of breaks

FIGURE VII: NUMBER OF BREAKS IN ROTOR SPINNING FROM DIFFERENT COTTONS AND THEIR PREPARATION



associated with small slubs or neps, i.e. entanglement-related breaks, remained relatively constant for a particular cotton. It is possible that these defects originate in processes subsequent to carding.

*** *** To Be Continued *** ***

NFFPC MEETS AT INTERNATIONAL CENTER

The Natural Fibers and Food Protein Commission of Texas (NFFPC) held its annual budget review meeting at the International Center on April 25. The Commission sponsors research at four universities in Texas and conducts an annual meeting to review the various research programs and approve budgets for future studies.

The four universities which contract research with NFFPC are Texas A&M University, the University of Texas at Austin, Texas Woman's University at Denton, and Texas Tech University. The Commission is a state agency that has recently been given increased support for sponsoring research that will find greater uses for the natural fibers and food products grown in Texas. NFFPC holds considerable importance for the state, since Texas annually produces 30% to 35% of all the cotton in the United States, 20% of the U.S. wool, and 92% of the mohair. The total annual value of these three fibers is $1.3 billion.

NFFPC Executive Director Carl Cox stated that the meeting held at the Center was the best attended the Commission has ever experienced. Eighty-two persons were present for the various program reviews and consideration of budget requirements. Also, students from Texas Woman's University and Texas Tech University participated in a fashion show featuring garments made from TEXCELLANA® fabrics produced at ICTRD. TEXCELLANA research has been sponsored by NFFPC.

VISITORS

April visitors at the International Center included Gary Wells and Akiva Pinto, Hollingsworth Inc., Greenville, SC; Christopher Dioguardi, K-Mart Corp., North Bergen, NJ; Jaime A. Espinal, EsTex Import/Export Co., Dallas, TX; Gary C. Holland, Custom Metal Fabrication, Kings Mountain, NC; Dan Stokes and Arthur Brunner, Rieter Corp., Spartanburg, SC; Guido Bausch, Manfred Frey, Robert Demuth and Heinrich Störi, Machinenfabrik Rieter AG, Winterthur, Switzerland; Helmut Deussen, Schlafhorst Inc., Charlotte, NC; J. Derichs and Hans Raasch, W. Schlafhorst Co., Mönchengladbach, West Germany; Barbara Shaeffer, Motion Control Inc., Dallas, TX; Werner Stapter, Joachim Blass, Alder Heinz and Audie Gigandet, Peyer AG, Wollerau, Switzerland; Stephan Hladik, F. M. Hammerle, Dornbirn, Austria; Paul Kiekens, Laboratorium de Meulemeester, Gent, Belgium; Demetrio Neri, Manufattura di Legnano, Legnano, Italy; Ross Griffith, University of New South Wales, Kensington NSW, Australia; Yung Chae (Terry) Lee, Terry Trading Co., Seoul, Korea; C. J. Von Der Merwe, South African Cotton Board, Crecy, South Africa; J. C. Schoeman, Pietersburg, South Africa; and John M. Cageao and Juan Manuel Cageao, John M. Cageao, S.A., San Jose, Costa Rica.

Also, a group of New Mexico Extension agents including James D. Duncan, Tucumcari; W. R. Thompson, Roswell; Bruce Henricks, Clovis; Carlos Manzanres, Los Ojos; Leigh Ann Mares, Santa Rosa; Lee Watts, Carlsbad; Wallace M. Cox, Lovington; and Sid Gordon, Carrizozo, visited the Center.

In addition, 300 visitors came in groups from Texas Tech University, area high schools and elementary schools, and Texas Extension organizations.