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.

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.

![Figure IV](image_url)

**Figure IV**
DISTRIBUTION DATA FOR FIBER LENGTH IN SLIVER SAMPLES (Weight-biased)

<table>
<thead>
<tr>
<th>Source of Cotton</th>
<th>Card</th>
<th>Length</th>
<th>Coefficient of Length Variation (%)</th>
<th>Short Fiber Content (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Upper Quartile (inches)</td>
<td>Mean (inches)</td>
<td></td>
</tr>
<tr>
<td>California</td>
<td>Single</td>
<td>1.15</td>
<td>0.91</td>
<td>33.5</td>
</tr>
<tr>
<td></td>
<td>Mk 1 Tandem</td>
<td>1.15</td>
<td>0.93</td>
<td>32.1</td>
</tr>
<tr>
<td></td>
<td>Mk 4 Tandem</td>
<td>1.16</td>
<td>0.93</td>
<td>31.4</td>
</tr>
<tr>
<td></td>
<td>Single</td>
<td>1.11</td>
<td>0.87</td>
<td>35.0</td>
</tr>
<tr>
<td></td>
<td>Mk 1 Tandem</td>
<td>1.06</td>
<td>0.83</td>
<td>36.7</td>
</tr>
<tr>
<td></td>
<td>Mk 4 Tandem</td>
<td>1.09</td>
<td>0.87</td>
<td>33.9</td>
</tr>
<tr>
<td>Delta</td>
<td>Single</td>
<td>1.34</td>
<td>1.04</td>
<td>37.4</td>
</tr>
<tr>
<td></td>
<td>Mk 1 Tandem</td>
<td>1.33</td>
<td>1.02</td>
<td>38.7</td>
</tr>
<tr>
<td></td>
<td>Mk 4 Tandem</td>
<td>1.34</td>
<td>1.04</td>
<td>35.7</td>
</tr>
<tr>
<td>Pima</td>
<td>Single</td>
<td>1.00</td>
<td>0.80</td>
<td>33.6</td>
</tr>
<tr>
<td></td>
<td>Mk 1 Tandem</td>
<td>0.94</td>
<td>0.74</td>
<td>38.0</td>
</tr>
<tr>
<td></td>
<td>Mk 4 Tandem</td>
<td>0.98</td>
<td>0.78</td>
<td>34.7</td>
</tr>
<tr>
<td>Texas</td>
<td>Single</td>
<td>1.15</td>
<td>0.905</td>
<td>34.9</td>
</tr>
<tr>
<td></td>
<td>Mk 1 Tandem</td>
<td>1.12</td>
<td>0.860</td>
<td>36.4</td>
</tr>
<tr>
<td></td>
<td>Mk 4 Tandem</td>
<td>1.14</td>
<td>0.905</td>
<td>33.9</td>
</tr>
<tr>
<td>Average</td>
<td>Single</td>
<td>1.15</td>
<td>0.905</td>
<td>34.9</td>
</tr>
<tr>
<td></td>
<td>Mk 1 Tandem</td>
<td>1.12</td>
<td>0.860</td>
<td>36.4</td>
</tr>
<tr>
<td></td>
<td>Mk 4 Tandem</td>
<td>1.14</td>
<td>0.905</td>
<td>33.9</td>
</tr>
</tbody>
</table>

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 ($\omega_e$) was 5.1 ($\omega_{tex} 4880$) 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
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\textsubscript{e} 40 (14.8 tex) was relatively low, then an attempt was made to spin N\textsubscript{e} 50 (11.8 tex). If the breakage rate was clearly excessive, then production of the N\textsubscript{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\textsubscript{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\textsubscript{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\textsubscript{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
associated with small slubs or neps, i.e. entangle-
ment-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 Com-
mission of Texas (NFFPC) held its annual budget review 
meeting at the International Center on April 25. 
The Commission sponsors research at four univer-
sities 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 Uni-
versity of Texas at Austin, Texas Woman’s University 
at Denton, and Texas Tech University. The Commiss-
on is a state agency that has recently been given in-
creased support for sponsoring research that will find 
greater uses for the natural fibers and food products 
grown in Texas. NFFPC holds considerable impor-
tance 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 ICTRLD. 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, Maschinenfabrik Rieter AG, Winter-
thur, Switzerland; Helmut Deussen, Schlaffhorst Inc., 
Charlotte, NC; J. Derichs and Hans Raasch, W. 
Schlaffhorst Co., Mönchengladbach, West Germany; 
Barbara Shaeffer, Motion Control Inc., Dallas, TX; 
Werner Staptor, 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 

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 organi-
zations.