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RESEARCH ON TANDEM CARDING

The International Center has recently completed an extensive evaluation of tandem carding. The objectives of this were to compare the performance of a tandem card with a single card, to study the influence of different carding treatments on the quality of the cotton processed, to evaluate the removal of foreign material, and determine the effects on rotor spinning performance and yarn quality. A report on this was distributed at the recent American Textile Machinery Exhibition in Greenville, South Carolina.

The study was sponsored by Crosrol Ltd. of Halifax, England and the Natural Fibers and Food Protein Commission of Texas. The report was given to many individuals attending the machinery exhibition, but we realize there may be some of our friends in various parts of the world who could not attend that show. Therefore, we have requested and received permission to carry the report on this study in *Textile Topics*.

John B. Price, Assistant Director of ICTRD, was responsible for the overall direction of the study and for writing the report. He was assisted by Edwin R. Foster, head of mechanical processing; William D. Cole, manager of open-end spinning; technicians Ramon Ortiz, Danny Rodriguez, Albert Esquibel and Joe Luis Deleon; and Chris Snapp, Debbie Simpson and Harriet Boone, publications.

It is not practical to publish the entire report in a single issue of *Topics*, so we have decided to serialize it in several issues. The following is the first portion and the remainder will be carried in subsequent issues.

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THE BENEFITS OF TANDEM CARDING FOR FINE COUNT ROTOR SPINNING PERFORMANCE

1. Introduction

In 1988, a research project was agreed upon to study the influence of three different carding treatments upon the processing characteristics of cottons which had been shown to differ in the nature of their respective contaminants. The study was to be sponsored jointly by Crosrol Ltd. of Halifax, England and the Natural Fibers and Food Protein Commission of Texas, Dallas, Texas.

The cottons were obtained from four different, but major, growing areas in the United States. In a previous evaluation, [1] these cottons had been shown to have different performances when rotor spinning yarns of linear density, N_e 30 (19.7 tex) and finer. These differences in stability were not explained by fiber properties but by the nature and/or quantity of contaminant. In particular, the performance of the California cottons studied was largely dictated by the incidence of seed coat fragments to the extent that spinning was less stable than shorter, traditionally less desirable, cottons.

The purpose of this study was to assess the benefits of Tandem carding . . . , particularly from the aspect of the potential for improving rotor spinning performance. The single card was a John D. Hollingsworth High Production Card. The Tandem card was the Mark 1 model manufactured by Crosrol Ltd. Both were installed at the International Center for Textile Research and Development (ICTRD).

To assess the performance of the latest version of Tandem card, the Mark 4 model, portions of the bales of cotton were converted into sliver by Crosrol Inc. of Greenville, South Carolina and returned to the ICTRD for evaluation.

This report is a synopsis of a larger report which is available from either of the research sponsors (Crosrol Ltd. or the Natural Fibers and Food Protein Commission of Texas), or ICTRD.

2. Raw Materials

The cottons used in this study were chosen to represent the four major qualities which are produced in the United States. They were obtained commercially from California (San Joaquin Valley), Mississippi (Delta), and Texas (High Plains). The fourth type was Pima cotton grown in Arizona.

Each cotton used in the study was a blend of three bales of essentially the same fiber properties which were judged to be typical of the annual production of its region. All cottons were grown in 1985 and were of good grade, either Middling or better.

Other than the Texas product, the Micronaire value of the cottons was in the premium range at 4.2, and the Pima, California and Delta cottons provided a range of progressively reducing fiber lengths and strengths. The Texas cotton was shortest and of low Micronaire value (3.5).

The fiber properties for each cotton are presented in Figure I, and are the averages of the three constituent bales. The Pima cotton was the longest, strongest, finest and most mature of all. The Texas cotton was shortest and least mature of the fibers but of similar fineness to the California cotton. The Delta cotton was of similar strength (as measured by Stelometer) to the Texas cotton and coarsest of all those cottons evaluated.

FIGURE I

FIBER PROPERTIES

Property	California	Delta	Pima (Arizona)	Texas
Individual Instruments				
Tenacity (g/tex)	28.1	24.5	36.1	24.5
Elongation (%)	5.39	6.02	6.19	6.84
2.5% Span Length (in)	1.15	1.10	1.36	1.01
Uniformity Ratio (%)	45.8	43.1	46.2	44.2
Short Fiber Content (%)	3.1	7.6	2.5	7.0
Micronaire Value	4.2	4.2	4.1	3.5
Non-lint Content (%)	1.08	1.48	2.56	2.25
Pressley Strength (Mpsi)	99.3	90.5	107.2	90.7
Peyer AL-101				
Upper Quartile Length (in)	1.13	1.09	1.35	0.97
Mean Length (in)	0.90	0.87	1.12	0.76
CV% of Length (%)	33.4	34.4	29.0	35.3
Short Fiber Content (%)	12.8	15.0	5.5	20.5
IIC/Shirley F/MT Ia				
Micronaire Value	4.27	4.30	4.01	3.70
Maturity (%)	89.1	85.4	92.2	75.3
Fineness (mtex)	160	168	143	158
High Volume Instrument Data				
Strength (g/tex)	28.0	24.0	36.4	27.0
Elongation (%)	5.50	5.57	6.54	6.17
Length (in)	1.15	1.12	1.36	1.03
Length Uniformity (%)	83.7	82.0	85.5	80.7
Micronaire	4.2	4.1	4.0	3.6
Leaf	2	2	3.2	2
Reflectance, R_d (%)	76.0	76.0	62.2	74.7
Yellowness, +b	9.7	8.5	12.2	8.7

3. Sliver Preparation

Cotton from all three constituent bales was blended at the hopper feeder and processed into sliver using the sequence of machinery shown in Figure II [at right]. The opening and cleaning equipment installed at ICTRD contained one major cleaning point, namely the step cleaner. The blowroom used at Crosrol Inc. had no major cleaning point, since it was designed only to loosen pre-cleaned stock provided by mills for evaluation in a demonstration area.

Card sliver of 70 gr/yd (0.119 hank, 4.96 ktex) was produced from each type of card. The single card was run at 60 lb/hr compared to 75 lb/hr with the Mark 1 Tandem card and 110 lb/hr with the Mark 4 Tandem card. All slivers were reduced to 35 gr/yd (0.238 hank, 2.48 ktex) in two passes with a Zinser 720 D drawframe in preparation for spinning.

Figure III [at right] shows the waste data and nep counts from card web samples for each cotton processed wholly at ICTRD. In general, the waste produced from the Tandem card was a little greater than that produced by the single card. The number of neps counted were consistently fewer in webs from the Tandem rather than the single card.

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This concludes the first portion of the report on tandem carding. The second installment will be presented in next month's issue of *Textile Topics*.

FIGURE II

OUTLINE OF MECHANICAL PROCESSES

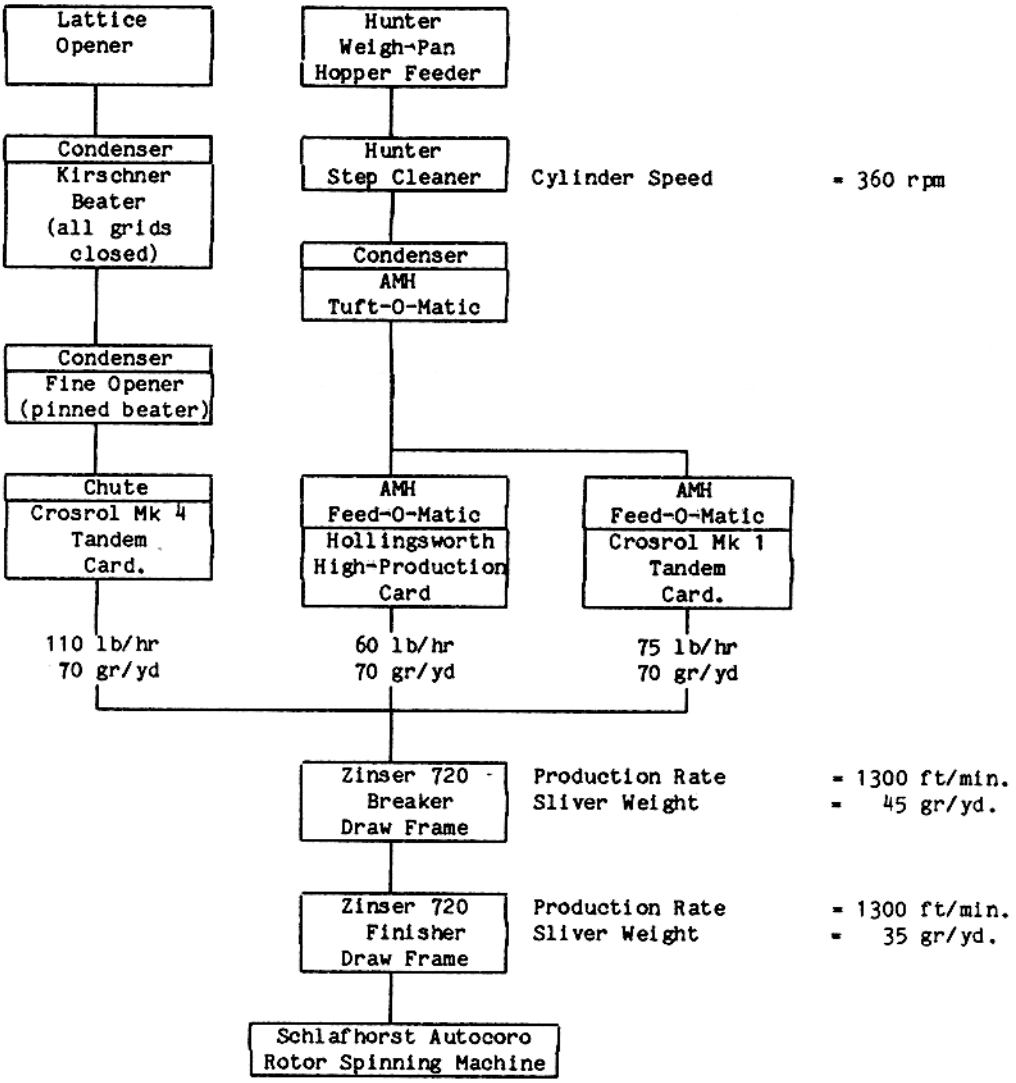

FIGURE III

OPENING AND CLEANING DATA

Cotton	Card	Opening Waste (%)	Card Waste (%)	Total Waste (%)	Neps per Grain
California	Single	0.22	2.27	2.49	2.97
	Mk 1 Tandem	0.27	2.49	2.76	2.71
Delta	Single	0.27	2.38	2.65	4.32
	Mk 1 Tandem	0.27	3.12	3.39	3.78
Pima	Single	0.88	2.80	3.68	2.70
	Mk 1 Tandem	0.99	2.53	3.52	1.79
Texas	Single	0.33	2.46	2.79	5.94
	Mk 1 Tandem	0.32	3.74	4.06	4.05

VISITORS

Visitors during March included Timothy K. Keilty, Western Cotton Services Corp., Phoenix, AZ; Charles Curry, Roberts & Curry, Greenville, SC; John Parker and Jack Keasler, Stewart's of America, Simpsonville, SC; Margaret Herring, University of Texas, Austin, TX; Gregg Ulvestad and H. N. Hensley, PSI Environmental Services, Midland, TX; Harold Hamilton, Piedmont Chemical Industries Inc., High Point, NC; Steve Evans, Southwest Texas Telephone Company, Rocksprings, TX; Carson Gilmer, UDP Inc., San Antonio, TX; Dick Bassett, University of California, Shafter, CA; Franco Oetterli, Rieter Corporation, Spartanburg, SC; and Georg Iberle, Schubert & Salzer Maschinenfabrik, Ingolstadt, West Germany.

Other visitors included 136 students from area elementary schools and eighteen residents of John Knox Retirement Village in Lubbock.