



# TEXTILE TOPICS

INTERNATIONAL TEXTILE CENTER • TEXAS TECH UNIVERSITY  
LUBBOCK, TEXAS USA

## ITC JOINS COLLEGE OF AGRICULTURAL SCIENCES AND NATURAL RESOURCES

Over the past decade, the ITC has existed as an autonomous entity within Texas Tech University, reporting directly to the Office of Research Services. As of April 1, 1998, the ITC became a part of the College of Agricultural Sciences and Natural Resources. Multidisciplinary collaboration will continue to be fundamental to the mission of

the ITC; indeed, such collaboration will be facilitated by the College. The affiliation will also enable effective support from the natural fiber sectors of Texas, which have always been the foundation of the ITC's support and which have a renewed focus on developing and serving the value-added textile industry.

## NEW TEXTILE MILL COMING TO WEST TEXAS

Lorber Industries of Texas will be going on line this summer in Snyder, Texas, 80 miles southeast of Lubbock. Its first phase will consist of open-end rotor spinning, producing high quality knitting yarns. Part of the yarns produced will be sent to the parent company, Lorber Industries of California, based in Los Angeles. The ITC has provided a training program for employees who will be involved in the start-up of the textile mill. Further training and technical services will be provided to the company as needed.

## NEW RIETER R20 SPINNING FRAME TO BE INSTALLED

The ITC has taken delivery of a new Rieter R20 spinning frame. It is a short frame version of the rotor spinning frames to be installed for Lorber Industries of Texas. Installation at the ITC will precede the installation for Lorber Industries, thereby allowing its immediate use by ITC and Reiter personnel for training and demonstration.

## NEW FURNITURE FOR CONFERENCE ROOM

The generosity of the CH Foundation has enabled the purchase of a new conference table and a full contingent of chairs for the ITC conference room. Also, a new full-service credenza for storing dishes and serving at diverse functions in the conference room and throughout the building was obtained. These will greatly facilitate the educational and service activities of the ITC.

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# FINENESS/MATURITY RESULTS FOR THE LATEST GENERATION OF AFIS

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*These results were presented to the International Committee on Cotton Testing Methods, March 10, 1998, in Bremen, Germany.*

## Introduction

This is a progress report on a comparative analysis of the fineness/maturity measurement in the latest generation AFIS machine at the International Textile Center. Comparisons are made with other measurements that also capture information related to fineness and maturity. These are the following:

- HVI micronaire
- FMT micronaire
- FMT maturity ratio
- FMT fineness
- AFIS diameter (from older generation AFIS)

Comparisons are also extended to the predictive power of fineness and maturity measurements on the levels of fiber bundle strength and yarn strength. This is done for yarns spun both on the ring spinning system and on the open-end rotor spinning system.

Comparisons among the fiber measurements come from a sample of 191 Upland and extra long staple (ELS) cottons from over the world.

For analysis related to the spun yarns, the results were taken from a subset of 66 cottons, with all of these being Upland type cotton. The limited number is only because spinning tests are not completed; these tests are now in the process of being done.

## Correlations Among Fiber Variables

The correlation matrix for the fiber measurements on the different instruments is shown in Exhibit 1. As we would expect, the correlation between the two micronaire measurements, the HVI versus the FMT, is quite close to 1.0 (at 0.97). Also, when we regressed one upon the other, the regression line has a slope very close to one and an intercept very close to zero. Of course we know that micronaire is an ambiguous estimate of fineness and maturity combined; therefore, it is imperative that we develop measurements that separate fineness and maturity with adequate precision.

**Exhibit 1. Correlation Matrix for Fiber Measurements**

		HVI	FMT		Old AFIS	New AFIS		
		Micronaire	Micronaire	Mat. Ratio	Fineness	Diameter	Fineness	Mat. Ratio
HVI	Micronaire	1						
	Micronaire	0.97	1					
FMT	Mat. Ratio	0.74	0.73	1				
	Fineness	0.71	0.73	0.14	1			
Old AFIS	Diameter	0.45	0.43	0.01	0.67	1		
New AFIS	Fineness	0.72	0.71	0.34	0.74	0.83	1	
	Mat. Ratio	0.59	0.60	0.70	0.16	- 0.27	0.24	1

It is also seen in Exhibit 1 that the micronaire values are highly correlated with FMT maturity and fineness and with new AFIS fineness; all correlation coefficients are above 0.7. The micronaire correlations with new AFIS maturity are somewhat lower, at about 0.6. But the correlation coefficients between micronaire and the old AFIS diameter measurements are low, at 0.45 and 0.43.

Comparing the three fineness measurements (FMT fineness, old AFIS diameter, and new AFIS fineness) reveals that the correlation among them is high: 0.67 for diameter versus FMT fineness and a notable 0.83 for diameter versus AFIS fineness. The Correlation between FMT fineness and AFIS fineness lies between these two, at 0.74. Somewhat lower still is the correlation between the two maturity ratio measurements from the AFIS and FMT, at 0.70.

As we would expect with a global sample of cotton, none of the statistical correlations between maturity ratio measurements and fineness measurements are significantly different from zero (Exhibit 1). The diameter measurement is almost perfectly uncorrelated with FMT maturity and is negatively (but insignificantly) correlated with AFIS maturity.

The diameter measurement has always seemed to be a conceptually important one. While we do not know exactly what measurement is being captured by the AFIS, if the diameter measurement is truly connected with the theoretical diameter of the cotton fibers, then it should be a powerful predictor of textile performance of the fibers.

### Use of Standard Fineness

At the ITC we are applying the concept of “standard fineness”—defined as the ratio of fineness to maturity ratio. It is well known in scientific circles that a cotton fiber’s diameter and perimeter are proportional to its standard fineness. Of strategic concern, however, is just how well the measuring instruments are capturing any of these concepts.

Of course we can derive estimates of standard fineness from measurements of fineness and maturity ratio with the FMT and the new AFIS. This was done, and the resulting correlations between these standard fineness estimates and the other fiber measurements are summarized in Exhibit 2. None of the correlations associated with the FMT measurements of standard fineness are noteworthy; indeed, they are

**Exhibit 2. Correlations Between Standard Fineness Measurements and Other Fiber Measurements**

		FMT	New AFIS
		Standard Fineness	Standard Fineness
HVI	Micronaire	-0.09	0.16
	Micronaire	-0.08	0.14
FMT	Mat. Ratio	-0.70	-0.25
	Fineness	0.59	0.50
Old AFIS	Diameter	0.47	0.91
New AFIS	Fineness	0.25	0.66
	Mat. Ratio	-0.44	-0.57

impossible to interpret. For the new AFIS, however, the correlation of 0.91 (shaded cell in Exhibit 2) with the old AFIS diameter measurement immediately caught our attention. As we might expect after seeing these correlations, the correlation between FMT standard fineness and AFIS standard fineness is not high, at only 0.55. We are led to the conclusion that one of these measurements must be wrong; it is possible that they both are wrong, but one of them must be.

### Predictive Power of Fiber Fineness Measurements

In order to assess the “relative correctness” (or at least the usefulness) of the available fineness measurements, we may look at their ability to predict fiber bundle strength and yarn strength. For fiber bundle strength, we know that factors affecting it include: individual fiber strength, individual fiber elongation, the number of fibers in the bundle, etc. Also, we know that, for a standardized bundle weight, the linear density of the fibers enables an approximation of the number of fibers in the bundle. Therefore, we can conclude that fiber fineness will correlate well with bundle strength. The correlation between fineness and bundle strength will be negative, because as fibers exhibit less fineness, the numerical measure increases, the number of fibers in the bundle

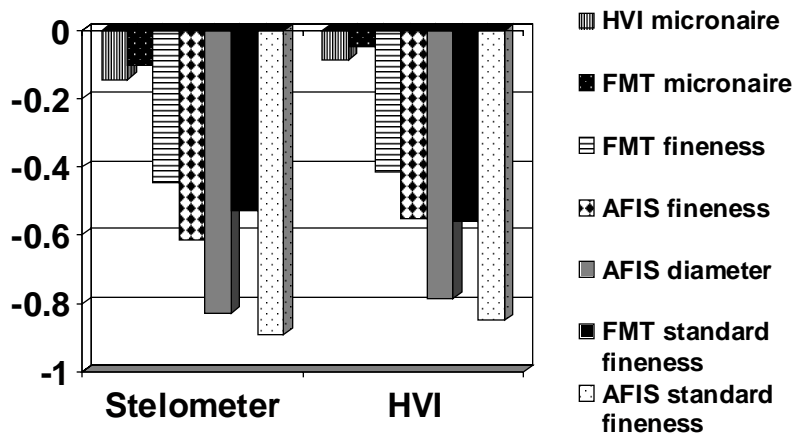
decreases, and the strength of the bundle decreases. Therefore, all measurements reflecting fiber fineness should have a correlation with fiber bundle strength between zero (implying no correlation) and a minus one (implying perfect correlation). The correlations of various fiber fineness measurements with the fiber bundle strength measurements from the Stelometer and the HVI are summarized in Exhibit 3.

Micronaire measurements from the HVI are poorly correlated with both Stelometer and HVI measurements and the FMT micronaire measurements are even worse (Exhibit 3). The FMT fineness is still quite poor at only about  $-0.4$  for either the Stelometer or the HVI. The AFIS fineness is somewhat better but still with an absolute value at about 0.6 or less.

The diameter measurement from the old AFIS gives us a quantum improvement in correlation, to approximately  $-0.8$  for both the Stelometer and the HVI (Exhibit 3). Clearly there is something useful in the AFIS diameter measurement.

Moving on to the standard fineness measurements, we find that the correlations for FMT standard fineness are somewhat improved over those for the unstandardized FMT fineness, but they are still poor (Exhibit 3). We are left with the conclusion that, whatever the FMT is measuring, it is not capturing the essence of fiber fineness.

**Exhibit 3. Correlation Coefficients: Fineness Measurements vs. Bundle Strengths**



When we consider the standard fineness taken from the new AFIS, we are given a pleasant surprise. We achieve correlations with the Stelometer and HVI bundle strength measurements that are slightly higher than even for the diameter measurement from the old AFIS (Exhibit 3). These results appear very worthwhile; they should encourage the further development and application of the standard fineness measurement that may be derived from the new AFIS.

Yarn strength is an ultimate objective for textile manufacturing. We know that factors affecting yarn strength include: individual fiber strength, individual fiber elongation, the number of fibers in the yarn cross section, the yarn count, the yarn structure, the friction forces among the fibers, etc. Since there are additional, major parameters involved in yarn strength, we would not expect that the levels of correlation with fiber fineness measurements to be as high as they are for fiber bundle strength. Nevertheless, the correlations should be important because, for a standardized yarn cross section and for a given yarn structure, the linear density of the fibers will determine the number of fibers in the cross section.

Representative results are shown for two yarn structures (from ring spinning and open-end rotor spinning systems) and for two yarn counts (36 Ne on the ring system and 28 Ne on the rotor system). The results for these two yarn

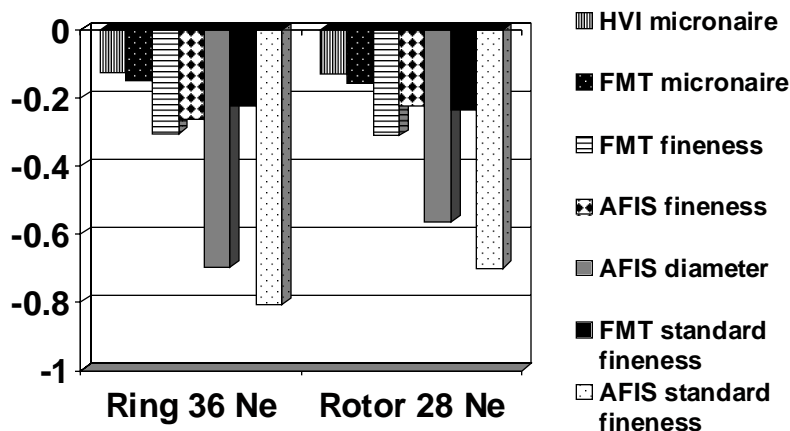
counts are quite consistent with results from other sizes.

A chart of correlation coefficients generally confirms our expectations for lower correlations among fineness measurements and yarn strengths (Exhibit 4). It also reveals the same general pattern of behavior among the alternative fineness measurements that were observed in Exhibit 3. Both micronaire measurements produce very low correlations and both of the fineness measurements are also disappointingly low. But the old AFIS diameter measurement again produces a remarkable jump in correlation (reaching -0.7 for the ring yarn and -0.6 for the rotor yarn.) Finally the FMT standard fineness again fails to correlate well, while the new AFIS standard fineness is again the star performer (reaching -0.8 for the ring yarn and -0.7 for the rotor yarn).

### Conclusion

These results suggest that more attention should be focused on the meaning and measurement of standard fineness. We are hopeful that our new AFIS will provide a platform for bringing this measurement to the forefront. Conceptually, such a measurement already embodies both the fineness and the maturity dimensions, both of which are known to be fundamental indicators of the use-value of cotton fibers in textile manufacturing.

**Exhibit 4. Correlation Coefficients: Fineness Measurements vs. Yarn Strengths**



## **PHI PSI CONVENTION HELD IN LUBBOCK**

Phi Psi, a national textile fraternity for textile engineers and textile science students, held its annual convention in Lubbock at the end of February. "Jeans to Genes in the Global Marketplace" was the theme with visits to the ITC and to American Cotton Growers denim mill (ACG). Seventy-five students, faculty, and alumni from Clemson, NC State, Auburn, Georgia Tech, Philadelphia College of Textiles, Southern Polytechnic, University of Mass at Dartmouth, Institute of Textile Technology and Texas Tech attended the meeting. Highlights included a talent show Thursday night, a country and western dance and barbecue at 4BarK, and a Mexican fiesta banquet on Saturday night. At the banquet, Dr. Ethridge was inducted in as an honorary member of the Kappa-Phi Psi West Chapter along with Danny Davis, plant manager of ACG, Joe Thompson, owner of Southwest Textiles, and Cal Brints, owner of Oak Creek Products.

## **NEW OPEN-END SPINNING MILL FOR SNYDER**

By summer, a new textile mill will be spinning open end yarn on the edge of the world's largest cotton patch. The new mill, Lorber Industries Texas, is located in Snyder and will be operating by mid-1998. Yarn from the mill will be shipped to Lorber Industries of California, the parent company, to supply its own knitting machines and to sell to other knitters.

The mill is located on the edge of Snyder, near the intersection of Highways 82 and 180, in a new area called SnTx Industrial Park. The building will be finished in April with equipment to be installed immediately.

Jack Whitworth is plant manager and Dwight Jackson is director of administration and cotton buyer.

The Snyder location gives good access to the High Plains and Rolling Plains cotton crop. Yarns produced will be open end spun, 16 to 18's singles, knitting yarn going into golf shirts, T-shirts, polo-type shirts, and other knit apparel.

Phase I of the project includes a 70,000 square foot facility employing 50

people. Three to six more phases could be added in the next five years. Eventually, there may be as many as 200 employees.

Lorber has purchased a complete line of Reiter open-end rotor spinning equipment. From the 65 bale laydown, cotton will go to two levels of cleaning equipment. Draw frames will be RSB-30's and spinning will be six frames of R20's, each with 260 spinning positions.

The ITC is supporting Lorber and other Texas mills with research, consultation, technical assistance, testing and evaluation. An R20 spinning frame has been purchased by the ITC and will be used for training and support of the Lorber facility.

The first group of employees spent a week in March training at the ITC learning the short staple textile processing system. James Simonton, textile engineer, Bill Cole, manager of short staple processing, Pauline Williams, manager of materials evaluation, and the technicians in the various labs helped the students with hands-on learning, lectures, and a large reference manual.



## TRAVEL NEWS

In March, Dr. Dean Ethridge, director, and Eric Hequet, assistant director, went to Bremen, Germany to attend the International Committee on Cotton Testing Methods (sponsored by the International Textile Manufacturers Federation), followed by the Bremen International Cotton Conference. Afterward, they visited the Institute for Textile Production Systems within the Swiss Federal Institute of Technology (ETH), as well as the Mulhouse National School of Textile Industries in France (ENSITM) within the University of Haute Alsace in France. Also, they visited the Rieter Corporation and the Sultzer Corporation in Switzerland, and the Suessen Corporation in Germany.

Dr. Ethridge also traveled to Memphis, Tennessee, in March to participate in a meeting of the Committee on Cotton Quality Measurement. This is hosted by the Agricultural Marketing Service of the U.S. Department of Agriculture.

## HISTORICAL COAT RECREATION

The ITC is now working on a project with a California costuming company to recreate fabric for military coats dating from the late 1870s. The garments, which will be used in an upcoming film, are based on an original post-Civil War jacket on loan to the costuming company from the Smithsonian Institute. Historical correctness is a concern to the company, and it is the ITC's responsibility to accurately reconstruct the lining on the jackets. This gray flannel shirting material is made of a two-ply cotton pima warp with a filling of wool/cotton blend. After production of the film, the jackets are to be donated to a cavalry reenactment group.



## MEETING HELD BETWEEN TEXAS COTTON PRODUCERS AND CONE MILLS

On April 8, 1998, the ITC hosted a meeting between Mr. J. Patrick Danahy and a group of Texas cotton producers from the Texas Plains. Mr. Danahy is the President and CEO of Cone Mills, as well as the current President of the American Textile Manufacturers Institute. The Lubbock-based Plains Cotton Growers association organized the meeting. Its purpose was to enable a free and informal exchange of ideas on how the cotton production sector and the U.S. textile manufacturing sector can better work together.