TRC

TEXTILE TOPICS

TEXTILE RESEARCH CENTER • TEXAS TECH UNIVERSITY • LUBBOCK, TEXAS • USA

Volume XIV, No. 2
October 1985

COTTON FIBER STRENGTH In the August 1985 issue of *Textile Topics* (Vol. XIII, No. 12), we carried an article on fiber strength which was a brief statement about the comparison of measurements made by the Pressley tester using zero gauge and the Stelometer with a 1/8-inch gauge. We mentioned that we have never found a satisfactory means of converting from one measurement to the other, even though several formulas have been used for this. Our statement was, "Although we have seen formulas that attempt a conversion from zero-gauge (psi) to grams/tex, we have never found any means of converting accurately from one measurement to the other."

We have received several comments about that article, and we appreciate hearing from our readers. A letter coming from Europe included a formula that was suggested as a means of meeting "practical requirements" for the company represented by the writer. The formula is:

$$\sqrt{\text{Grams/tex}} \times 17.50 = \text{Pressley (MPSI)}$$

We are pleased to have this, and we want to mention that it is quite similar to one resulting from research conducted at the Textile Research Center. However, we still do not use a formula for converting from one measurement to the other. As we said in the August *Topics*, we much prefer to work directly with the Stelometer or an HVI system utilizing the 1/8-inch gauge for measuring cotton fiber strength.

When we heard from our friend about this, we decided to go back to the results of earlier research and review the matter once more. John B. Price, head of our research on new spinning technologies, and Harvin Smith, head of our materials evaluation laboratory, both reviewed this. Price responded with the following memorandum, which we quote, hoping this will be of some value to our readers.

PRESSLEY STRENGTH ZERO-GAUGE vs STELOMETER 1/8-INCH GAUGE

"The comparison of zero-gauge Pressley strength vs Stelometer 1/8-inch gauge strength was studied in detail in the TRC project 885. It was learned that the scatter of bale sample data [see graph on next page] for the thirty-six cottons used in the study was sufficiently excessive to indicate a rather poor relationship between the two measurements. The regression line in the graph is the first equation in the accompanying table. The error of estimation is about 3.6, which means that 67% of the time an actual value of Pressley strength will lie in the range "Estimated Pressley" ± 3.6 MPSI, which is not very good as has been emphasized in a previous report.

"The data do not support the notion that a satisfactory relationship between the two strength measurements can be established by the formula:

$$\text{Pressley} = 17.5 \times \sqrt{\text{grams/tex}}$$

There is too much scatter to discern departure from the simple linear equation.

"Regressions of Pressley were run on individual instrument fiber properties to give the other equations shown in the accompanying table. After tenacity, elongation as measured by Stelometer entered next, followed by length. The error term fell from 3.6 to 2.7 to 2.5 by these statistically significant entries into the equation. The equation containing tenacity, elongation and length is the best we have derived, yet the error term is still quite large.

"Thinking that the elongation term may have entered because of maturity, an equation was derived using only tenacity and maturity. The relationship was inferior to that of tenacity and elongation.

"The lack of usefulness of the Pressley strength measurement can also be gleaned from correlations with yarn strength. Typically, correlations with count-strength-product were about 0.7 for Pressley, but were 0.93 for Stelometer tenacity.

"If we perform a regression of Pressley on $\sqrt{\text{grams/tex}}$ for the thirty-six cottons used in our study, then:

$$\text{Pressley} = 11.20 + 15.6\sqrt{\text{grams/tex}}$$

with a correlation coefficient, $r = 0.7688$ and residual standard deviation (error) = 3.55, which is very similar to the simpler, but linear equation shown in the table.

"Forcing this equation to pass through the origin, that is, making the intercept = 0, we obtain the following formula:

$$\text{Pressley} = 17.86 \times \sqrt{\text{grams/tex}}$$

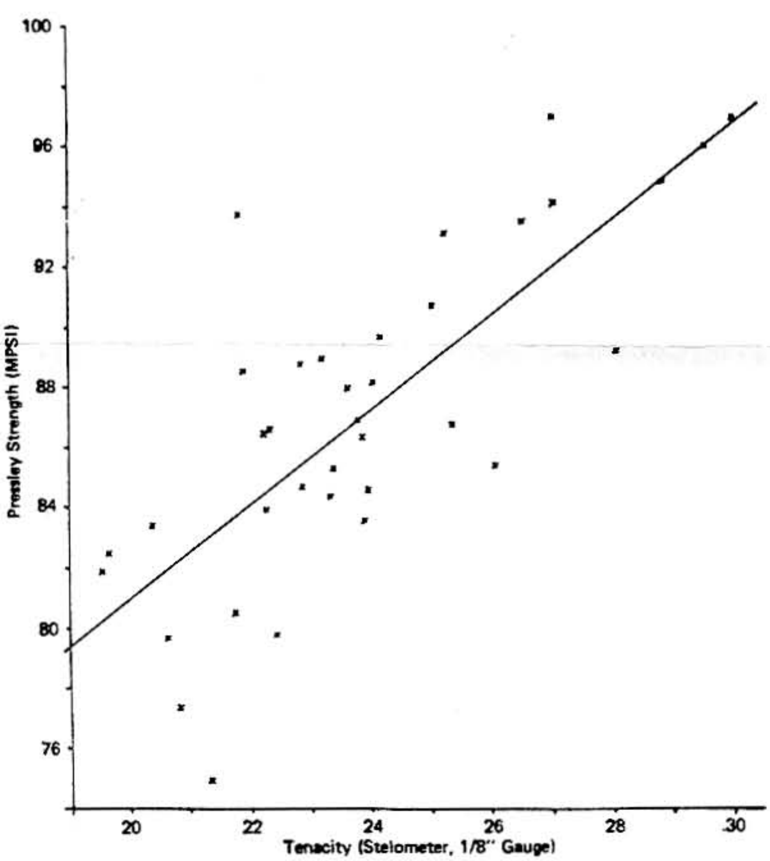
which is very similar to the equation quoted in the letter from our friend in Europe."

We have found this review of cotton fiber strength to be interesting, and we hope it will be informative to our readers. We will be pleased to hear from others about this.

RELATIONSHIPS BETWEEN PRESSLEY STRENGTH (Zero Gauge) and OTHER FIBER PROPERTIES

Regression Equation	Correlation Coefficient (r)	Coefficient of Determination (r^2)	Residual Standard Deviation
$p = 49.57 + 1.57\,s'$	0.7690	0.5913	3.55
$p = 74.17 + 1.41\,s' - 3.87\,e'$	0.8744	0.7645	2.74
$p = 39.07 + 1.40\,s' + 0.191\,m_a$	0.8558	0.7323	2.92
$p = 85.87 + 1.94\,s' - 4.36\,e' - 21.3\,\ell'$	0.9059	0.8170	2.45

s' = 1/8" Gauge Strength (gms/tex)
e' = Elongation
m_a = Percent Mature Fibers
ℓ' = Length



GRAPH 1

COTTON FIBER MATURITY In the July 1985 issue of *Textile Topics* (Vol. XIII, No. 11), we carried an article that commented on the relationship between cotton fiber maturity and micronaire measurement. The article stated, ". . .we have found that some varieties of cotton will mature with micronaire values as low as 3.2. The cotton spinning industry has stated that for rotor spinning . . . there is a need for a fine, strong cotton. . . ."

Since publishing that issue of *Topics*, we have received an inquiry from a U. S. textile company about the availability of fine, mature cotton. We were able to obtain samples of one variety, and after testing them here at the Textile Research Center, we sent them to the interested company. We feel it may also be of interest to others to have the test results, and we are presenting below a tabulation that shows the micronaire measurements made on two different instruments along with the percent mature fibers and fineness expressed in militex as measured by the IIC/Shirley Fineness/Maturity tester. (Please note we are giving percent mature fibers rather than the maturity ratio.) It will be seen that while the micronaire values range from 3.4 to 3.7, the percent mature fibers range from 79.4 to 86.6. By accepted standards for maturity, all of these cottons would be considered mature. In fact, one system of evaluating maturity specifies that any cotton that has 76% mature fibers (approximate maturity ratio of 0.86 or 0.87) is considered mature, and those with 84% mature fibers would be rated above average maturity. The average of this set of data is 83.4%.

COMPARISON OF MICRONAIRE, PERCENT MATURE FIBERS AND FINENESS

	Motion Control HVI System	Shirley Fineness/Maturity Tester		
Bale No.	Micronaire	Micronaire	Percent Mature Fibers	Fineness (mtex)
104	3.5	3.5	83.71	134
120	3.6	3.5	85.2	130
519	3.5	3.5	83.6	134
494	3.5	3.6	86.6	135
117	3.7	3.4	82.5	133
099	3.6	3.4	82.4	132
495	3.6	3.5	82.9	133
103	3.5	3.5	83.7	135
098	3.6	3.5	82.8	133
122	3.5	3.4	82.9	130
091	3.6	3.5	83.5	132
119	3.6	3.5	84.6	132
101	3.4	3.6	83.8	138
100	3.5	3.4	82.5	133
123	3.5	3.5	85.6	132
092	3.6	3.5	82.8	137
105	3.6	3.5	79.4	143
097	3.6	3.5	83.5	135
121	3.6	3.4	82.9	132
102	3.6	3.5	83.7	134

It is interesting to note that bale 101 had a micronaire value of 3.4 as measured by the Motion Control HVI system. If a USDA classing office had measured this cotton at the same level, then it would have been assigned a discounted price. However, it had 83.8% mature fibers, which would be considered mature by any standard. Actually, before we obtained samples of this cotton, these bales were classed by a USDA classing office and 5 of the 20 bales were assigned a micronaire below 3.3. The remaining 15 bales were measured at 3.3 or 3.4, which means that all 20 bales carried a discounted price. If the spinning industry is really interested in a fine, mature cotton, then it seems improper that the cotton farmer has to take a discount for producing this type of fiber. To the contrary, we feel the producer should get a premium price for growing a variety of cotton that would better meet industry's needs.

We continue to feel that a maturity value for cotton can be more meaningful to both the producer and the manufacturer than the micronaire values we have been using for so long. We expect to have the new Technicon maturity tester in our laboratory by late this year or early 1986, and we look forward to becoming much more involved in maturity testing. We also will continue to use the IIC/Shirley Fineness/ Maturity tester. The results coming from it are highly reliable and can be evaluated by well established standards. We plan to give additional information on this subject as it becomes available, and we will keep our readers informed on the progress we make in cotton fiber maturity measurements.

VISITORS Twenty-nine participants in the 1985 Cotton Orientation Tour visited the Textile Research Center on October 14. These were executives from textile organizations in Japan, Korea, Hong Kong, Taiwan, Singapore, Bangladesh, Thailand, Malaysia, Indonesia and the Philippines. The group was accompanied by Vaughn Jordan, Frank Waddle, Roger Yu and David Caywood, Cotton Council International; Tommy Horton, National Cotton Council; Mollie Iller, Quenton Gray and Mark Thompson, USDA-FAS; Role Cole and H. H. Ramey, USDA-AMS; and Bill Spencer, Cotton Grower Magazine. The Cotton Orientation Tour is sponsored each year by the National Cotton Council, Cotton Council International, and the United States Department of Agriculture.

In addition, the Cotton Leadership class for 1985-86, which is sponsored by the Cotton Foundation and conducted by the National Cotton Council, visited the Center as part of its training program. This group included Nancy H. Schrum, Hickory, NC; Nancy J. Patton, Lubbock, TX; Wick Dossett, Waco, TX; S. Steven Carl, Madera, CA; Rick Parsons, Vance, MS; Jack T. Walker, Jr., Casa Grande, AZ; L. Preuit Mauldin, Florence, AL; Steven C. Verett, Ralls, TX; Michael C. Francis, Peoria, AZ; and L. Gale Wisehart, Brawley, CA.

Other visitors included Frank X. Werber, USDA-ARS, Washington, DC; Lia Carver, Cotton Grower Magazine, Memphis, TN; J. Thomas Vernon, Burckhardt America, Inc., Greensboro, NC, Christoph Burckhardt, Christoph Burckhardt Ltd., Basel, Switzerland; John A. Inness and Altino Fortuna, Sao Paulo Alpargatas S.A., Sao Paulo, Brazil; Chris Gorst and Neil A. Doolan, Bradmill Textiles, Yarraville, Victoria, Australia; Norbert G. Stuhlfauth, Fils-Textil Gmbh., Reichenbach/Fils, Germany; Albert J. W. Bote, Baumwoll Kommissions-und-Lagerhauser Gesellschaft, Bremen, Germany; Alan Greenwood, Da Gama Textile Company (Pty) Ltd., East London, South Africa; 20 members of the Texas Farm Bureau Federation; and 140 elementary school students from the Petersburg, Texas school system.