TRC

TEXTILE TOPICS

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

Volume XI, No. 6
February 1983

OPEN-END SPINNING RESEARCH – Influence of Winding Tension on Yarn Properties In previous issues of *Textile Topics* (Vol. X, No. 12 and Vol. XI, No. 1), results were presented to illustrate the findings of an extensive study performed at the Textile Research Center to determine the combined influence of rotor speed and diameter on yarn properties. During the spinning trials, it was not possible to produce all the yarns that were intended, particularly the finer numbers (N_e 20 and 30), under conditions of high centrifugal force in the rotor. Failure to produce the yarns was not due to speeds being so high that piecing was impossible, nor was the spinning process unstable. The reason was that the yarns were being broken in the winding zone during take-up. Yarns were successfully produced when the tension draft was decreased, although properties of these were inconsistent with trends indicated by the yarns produced at a higher winding tension.

To quantify the influence of tension draft on yarn properties, a study was conducted using our Schubert & Salzer RU-11 machine spinning N_e 30 from a Texas cotton with a twist multiplier of 5.0, a smooth navel and an OB20 opening roller speed of 5,000 rpm. Using various combinations of rotor speed and diameter, winding was attempted at tension drafts from 0.93 to 0.99. The angle of wind was nominally 17° throughout. In general, tension drafts of 0.94 or less were felt to be too low for satisfactory winding. Similarly, tension drafts of 0.98 or greater were likely to cause breaks during take-up.

To illustrate some of the results of this study, two tables of yarn properties are given on the following page. Additionally, the properties of all yarns spun at the same tension draft were averaged over all combinations of rotor speed and diameter. The resultant trends in yarn quality with changing tension draft are illustrated in Graphs 1 through 6. The data show that increases in tension draft resulted in an attenuation of the yarn. Yarn strength increased but the elongation at break decreased. Non-uniformity and total imperfection rate apparently increased to a maximum at a tension draft of about 0.97, whereas the hair count of the yarns was at a minimum.

This project was sponsored by the Natural Fibers & Food Protein Commission of Texas and was conducted at TRC by John B. Price, head of open-end spinning research, with the assistance of William D. Cole and Albert Esquibel.

NEW UNIT INSTALLED IN HVI SYSTEM Motion Control, Inc. of Dallas, Texas recently installed a new unit in the HVI 3000 Fiber Information System that has been in use at the Textile Research Center since May, 1982. This addition is the MCI Type 423 Trash Meter. It determines the amount of non-lint matter on the surface of a cotton sample and gives the number of exposed non-lint particles. Measurements made by the Trash Meter designate an equivalent USDA leaf code. The information gained is quite helpful in evaluating the quality of a given cotton and adds to the already extensive information obtained by using HVI systems.

We are very pleased to have this new Trash Meter, and we appreciate the cooperation of Motion Control in making it available to us.

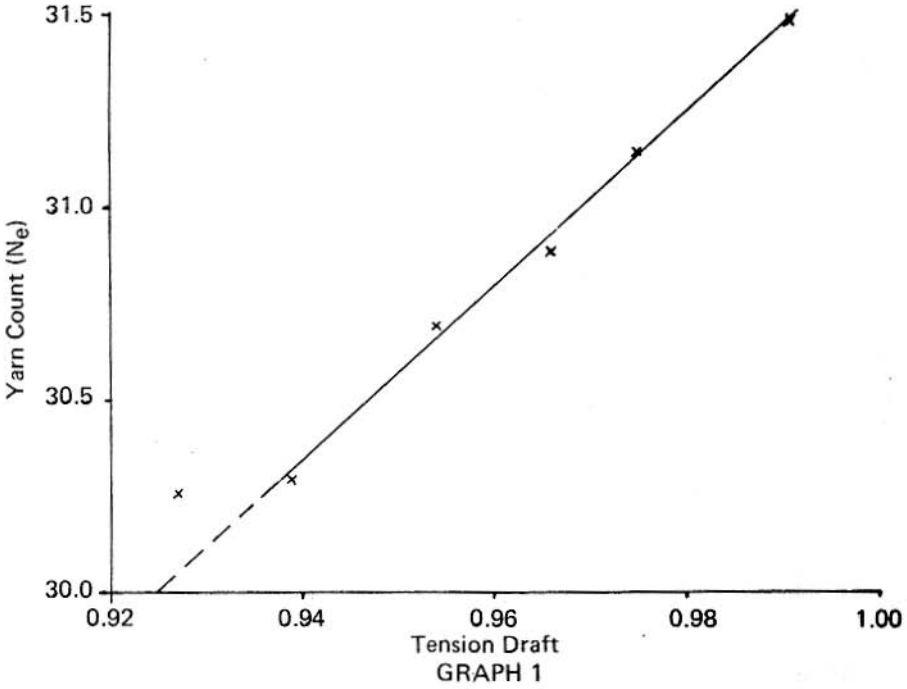
VISITORS We were pleased to have several groups visiting with us during February. Among these were an Agricultural Engineering class from Texas Tech University and the Preceptor Sigma Chapter of the Beta Sigma Phi sorority. Others visiting with us last month were Franklin S. Looney, E. I. duPont de Nemours & Company, Wilmington, DE; Herman Demmink, Pignone Textile Machinery Inc., Spartanburg, SC; Gene Duke and S. P. Sangupta, Southwest Seed & Delinting Co., Brownfield, TX; William H. Davis and Denise Puterbaugh, Ring-Around Products, Inc., Hale Center, TX; William Lalor, Cotton Incorporated, Raleigh, NC; Mr. & Mrs. Eugene Cross III, Cross Cotton Mills Company, Marion, NC; John A. Boland III, C. Allen O'Shields and Michael B. Boyette, Swift Textiles, Inc., Columbus, GA; Nicole Wasbergen, Deventei, The Netherlands; Els Vos, Leiden, The Netherlands; Reijo Selin, Oy Finlayson AG, Tampere, Finland; and Treesje Etten, Voorburg, The Netherlands.

TABLE I

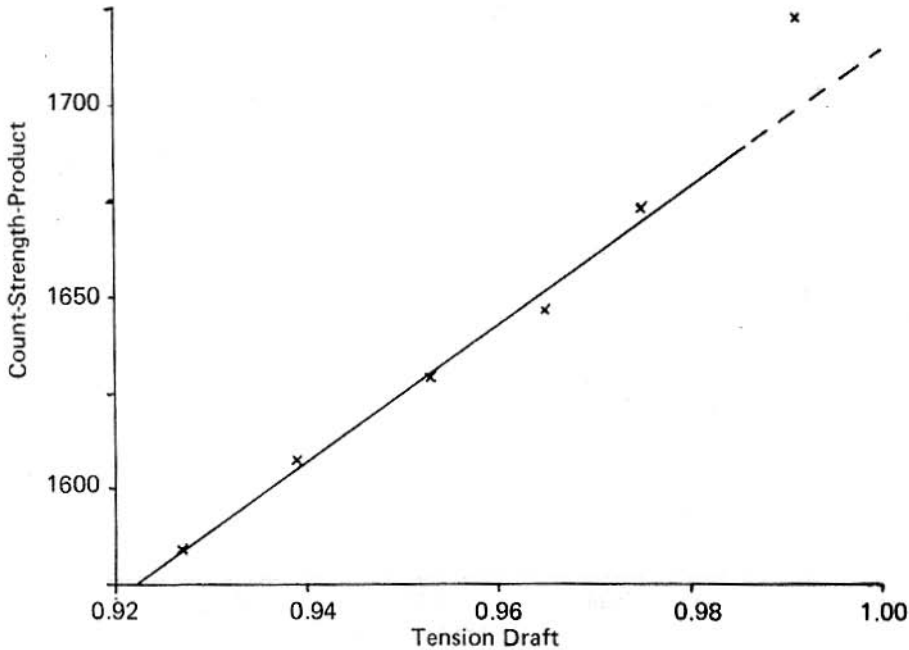
Rotor Spinning Machine:	Schubert & Salzer RU-11				
Nominal Yarn Number (N_e)	30				
Rotor Type:	48N				
Rotor Speed (rpm):	50,000				
Nominal Winding Tension Draft	0.927	0.939	0.953	0.965	0.975
Skein Test:					
Actual Yarn Number (N_e)	30.31	30.23	30.62	30.89	31.30
CV% of Yarn Number	1.0	1.1	1.1	1.2	1.4
Count-Strength-Product	1560	1552	1616	1628	1648
CV% of CSP	1.1	3.3	2.3	2.4	1.7
Single Yarn Tensile Test:					
Tenacity (g/tex)	9.97	10.24	10.71	10.42	10.43
Mean Strength (g)	195	194	207	197	204
CV% of Strength	9.7	9.7	9.6	10.1	8.9
Elongation (%)	8.5	8.1	7.8	6.7	5.8
Uster Evenness Test:					
Non-Uniformity (CV%)	17.10	17.61	18.56	18.48	18.55
Thin Places/1,000 yds	84	134	207	176	227
Thick Places/1,000 yds	185	258	432	470	438
Neps/1,000 yds	392	639	937	862	855
Hairs/100 yds	294	226	143	147	135
ASTM Yarn Grade	B	B	B	B	B

TABLE II

Rotor Spinning Machine:	Schubert & Salzer RU-11				
Nominal Yarn Number (N_e):	30				
Rotor Type:	48N				
Rotor Speed (rpm);	55,000				
Nominal Winding Tension Draft	0.927	0.939	0.953	0.965	0.975
Skein Test:					
Actual Yarn Number (N_e)	30.16	30.14	30.70	31.09	31.12
CV% of Yarn Number	1.3	1.2	1.3	1.1	1.5
Count-Strength-Product	1532	1576	1572	1577	1642
CV% of CSP	2.3	2.4	1.9	2.3	2.7
Single Yarn Tensile Test:					
Tenacity (g/tex)	9.95	10.09	10.04	10.14	10.59
Mean Strength (g)	192	198	195	194	208
CV% of Strength	8.7	9.0	10.8	9.7	9.3
Elongation (%)	8.2	7.8	6.9	5.8	5.1
Uster Evenness Test:					
Non-Uniformity (CV%)	17.36	17.81	18.54	18.84	18.66
Thin Places/1,000 yds	118	164	210	246	248
Thick Places/1,000 yds	222	306	436	537	480
Neps/1,000 yds	603	778	1054	1225	1106
Hairs/100 yds	278	158	128	149	128
ASTM Yarn Grade	C+	B+	C+	C+	B

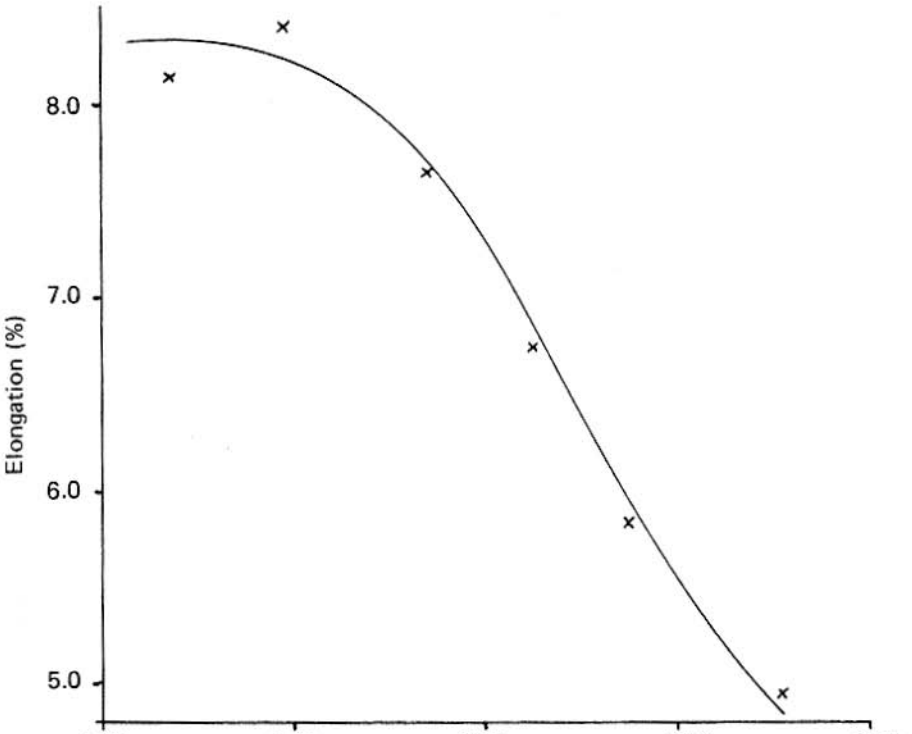


GRAPH 1

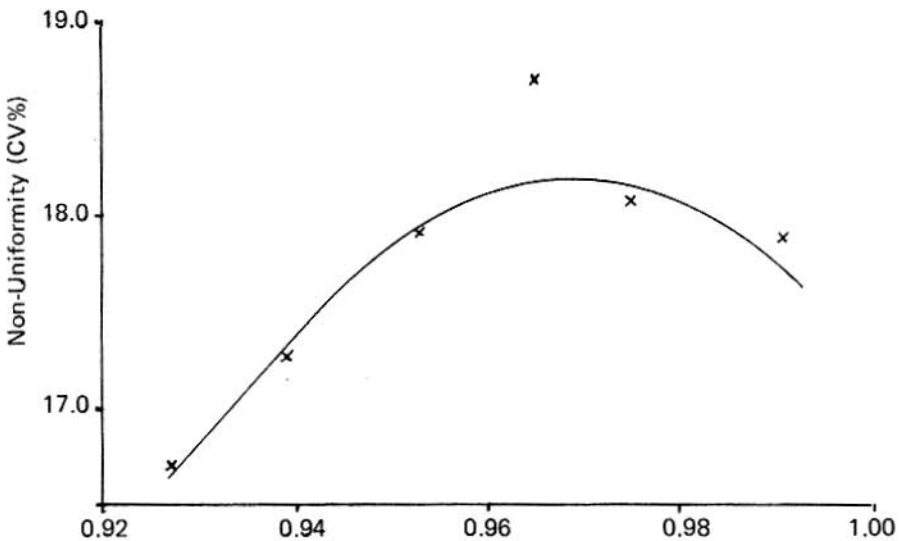


GRAPH 2

Influence of Tension Draft on Yarn Count and Count-Strength-Product

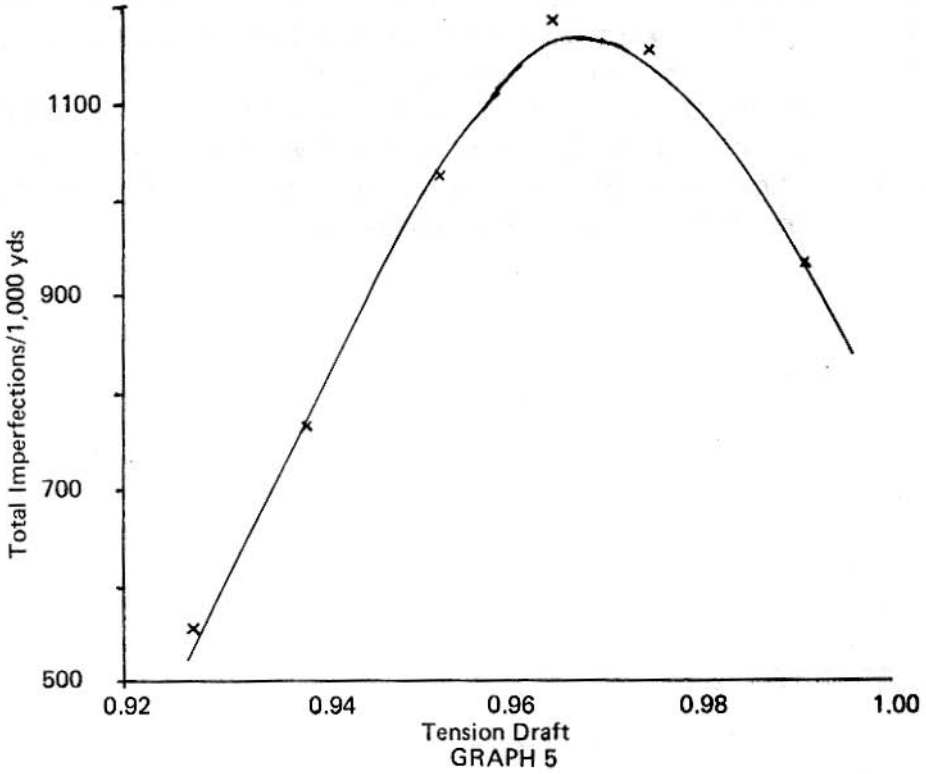


GRAPH 3

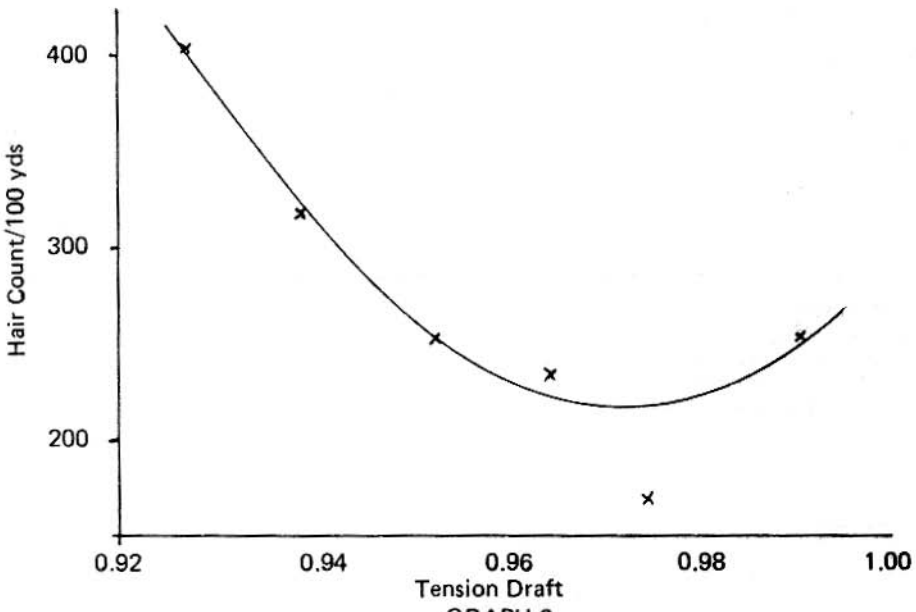


GRAPH 4

Influence of Tension Draft on Elongation and Non-Uniformity



GRAPH 5



GRAPH 6

Influence of Tension Draft on Total Imperfections and Hair Count