



**INFLUENCE OF OPEN-END SPINNING TENSION ON YARN ELONGATION** In the February 1983 edition of *Textile Topics* (Vol. XI, No. 6), we carried a report on the influence of tensions within the open-end spinning process on yarn properties. That report included the effects of various winding tensions on yarn strength, elongation, non-uniformity, total imperfections, and hair count. Our results at that time showed a direct relationship between tension draft and the strength of the yarn produced, with strength increasing as the tension draft increased. While we mentioned the effect on elongation, we did not emphasize it.

Within the past year, we have received several inquiries about the effect of O-E spinning tension on yarn elongation at processes following spinning, particularly at knitting. It appears that on occasion there has been insufficient elongation for satisfactory knitting, or at least a considerable force must be applied to the yarn to attain the desired performance. These inquiries brought about a limited study here at the Textile Research Center, and although our investigation was not exhaustive, there are some details we would like to pass along to our readers.

Thinking it will be helpful, we are reprinting two graphs that were carried in the February 1983 *Topics*. The first of these shows the influence of tension draft on the Count-Strength-Product. The yarn number in this case was  $N_e$  30 which was spun with a twist multiplier of 5.0 using a Schubert & Salzer RU-11 machine. It can be seen in Graph 1 that as the tension draft was increased from 0.927 to 0.991, the strength of the yarn increased proportionately. However, Graph 2 shows that during the same spinning, the yarn elongation decreased from approximately 8.5% to about 5%. While the additional strength gained may be desirable, the loss in elongation can be detrimental in certain processes.

We are offering the information published earlier simply to illustrate that yarn elongation can be reduced by certain spinning practices. The following information is related to this, but Graphs 3 and 4 are from a different study. These illustrate the force that will be required to obtain a certain degree of elongation from two different yarns, both  $N_e$  20, that were spun on the same RU-11 machine but under different conditions. The first of these was produced at a rotor speed of 55,000 rpm, and the second at 73,300 rpm. This is a 33% increase in rotor speed but a 78% increase in centrifugal force on the yarn during withdrawal from the rotor. When the two yarns were tested on our Uster Tensorapid instrument, the extra force significantly decreased yarn elongation. Graph 3 shows the stress/strain curve of the yarn that was spun at 55,000 rpm of the rotor, while Graph 4 is for the yarn spun at 73,300 rpm. Both of these had approximately the same breaking strength. However, the yarn spun at the lower rotor speed had a breaking elongation of slightly more than 5%, while the second yarn, spun at the higher speed, had an elongation of barely 3.5%.

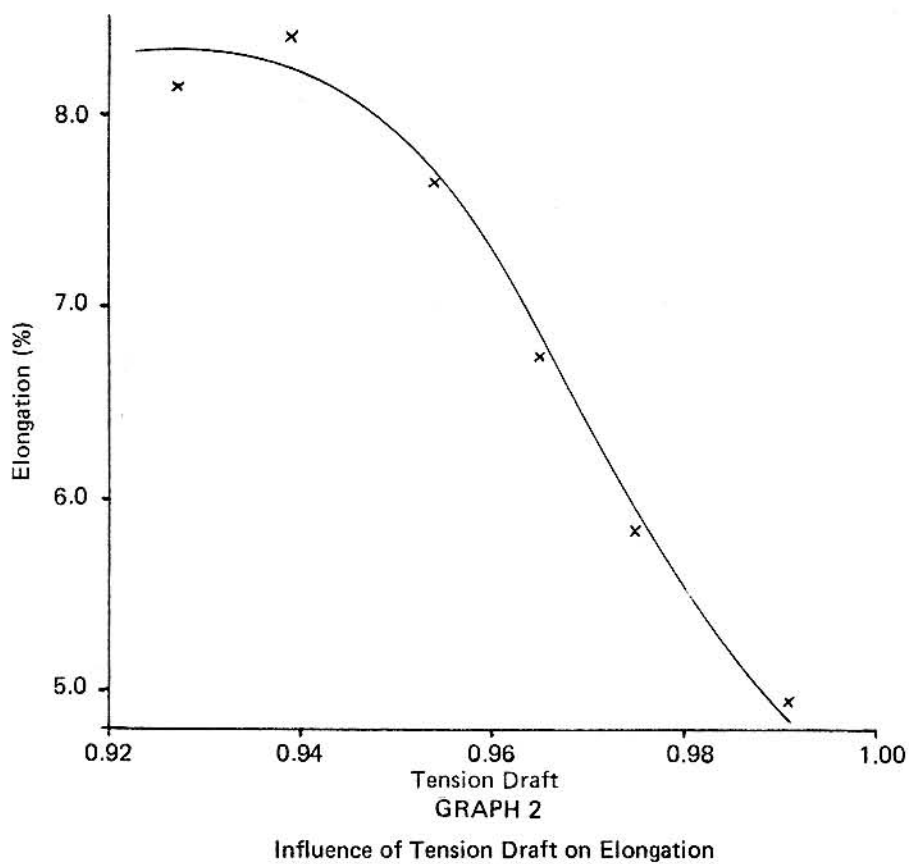
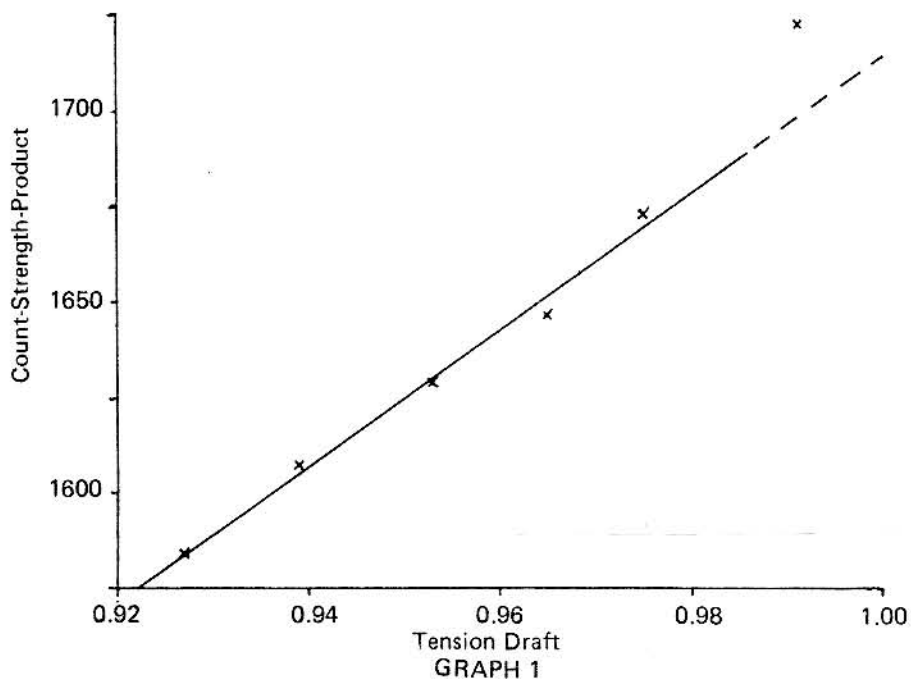
The significance of the decreased elongation in the second yarn can be realized if we will assume that during a subsequent process 2% extension will be required. For the yarn spun with the lower tension, 170 grams of force will be needed to extend the yarn by 2%. However, the yarn spun with the greater tension due to a higher rotor speed will require about 235 grams of force to produce the same extension. Looking at this from another direction, we might assume a force of 200 grams will be applied to the yarn at a given process, such as knitting. In this case, the yarn spun at the lower rotor speed and possessing the higher elongation would be extended by about 2.75%. However, 200 grams of force on the second yarn, spun at 73,300 rpm, would result in only about 1.4% elongation. It can be readily understood that while certain tensions applied during rotor spinning can give a stronger yarn, elongation of the yarn will be de-

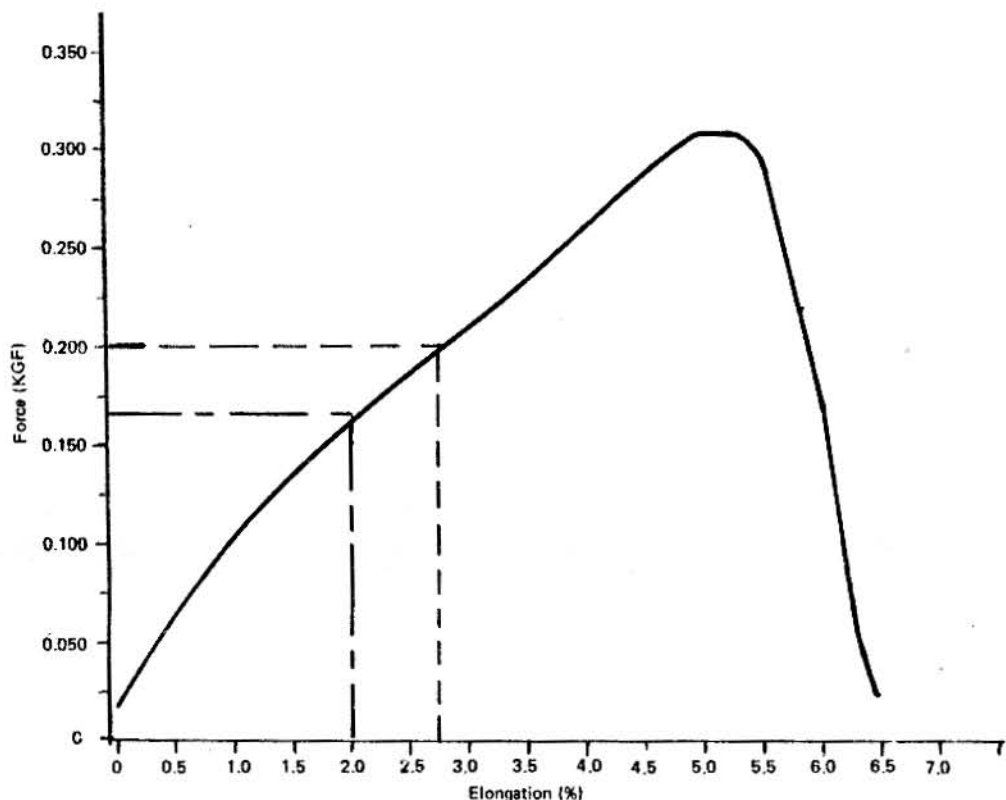
creased. This may cause a problem at subsequent processes, depending on what is done with the yarn.

While we do not feel that any startling revelation has come from these studies, we believe in view of the inquiries we have received, this report may have value to some of our readers. We think this may be particularly true for those who are using rotor-spun yarn at knitting. The information presented here was developed by John B. Price, head of our open-end spinning research.

**VISITORS** Visitors to the Textile Research Center during December included Michelle Woodruff, Cotton Incorporated, Raleigh, NC; Eric R. Lorthioisis, Santee River Wool Combing Co., Jamestown, SC; Robert W. Tonner, Prouvost, Lefebvre & Co., Inc., Boston, MA; Steve Clark, Gentex Corporation, Carbondale, PA; William A. Galloway, Little Cotton Manufacturing Co., Wadesboro, NC; Ed Harris, Riegel Textile Corp., Trion, GA; Douglas J. Stevens, Riegel Textile Corp., Atlanta, GA; and Francis E. B. Rainsford, Specialty Tops, Inc., San Angelo, TX.

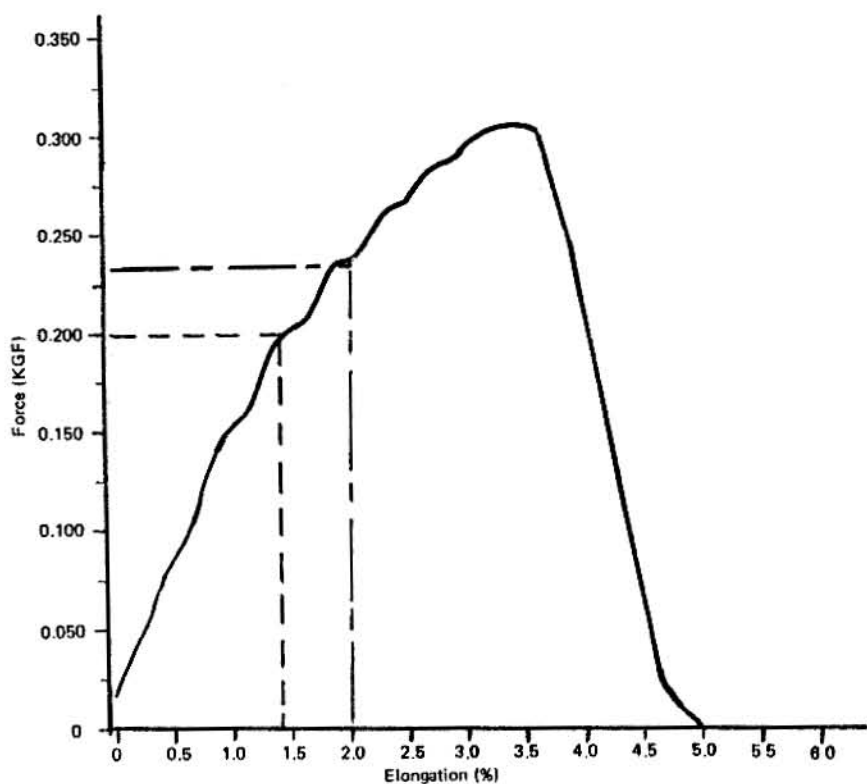
Also visiting were Yves Tenot, Tenotex, Lausanne, Switzerland; Arie Pulvermacher and Ishoi Doren, Israel Cotton Board, Tel Aviv, Israel; Auner Eshed, Hashalom Gin, Israel; Gideon Saluf, Milvot Milusiv, Israel; Litan Dauber and Hadani Zen, Kutnat Hadaron, Israel; and from the Chinese Academy of Sciences, Beijing, People's Republic of China, Mao Dehua, Xia Xuncheng, Shiung Chienhung, Wang Shuji, Guan Gui Lan and Wang Guifang.





GRAPH 3

Stress/Strain Curve — Uster Tensorapid  
(Ne 20 Yarn — 55,000 rpm Rotor Speed)



GRAPH 4

Stress/Strain Curve — Uster Tensorapid  
(Ne 20 Yarn — 73,300 rpm Rotor Speed)