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OPEN-END SPINNING RESEARCH — Influence of Rotor Speed and Diameter on Yarn Properties

In last month's issue of *Textile Topics* (Vol. X, No. 12), we carried a report on a TRC project which was designed to determine the combined influence of rotor speed and diameter on yarn properties. Using the various combinations of rotor speed and diameter which were available on three rotor spinning machines, the production of four yarn numbers (N_e 5, 10, 20 and 30) was attempted using three different fiber blends. These were 100% cotton, a 50/50 blend of cotton and polyester, and 100% polyester. Part of the data coming from this research was presented to show that, in general, the properties of rotor-spun yarn deteriorated when either rotor speed or rotor diameter was increased. (See Tables I and II in last month's issue of *Topics*.) In addition, it was observed that for a given yarn number the relationships between yarn property and rotor speed were different, but approximately parallel, for each size of rotor. This suggested that a single entity, plausibly centrifugal force, would describe a variation in yarn quality.

For each yarn number spun from each of the blends on each machine, the theoretical centrifugal force exerted on the yarn within the rotor was related to certain yarn properties, such as count-strength-product, elongation at break, etc., by means of linear regression. Unfortunately, it is not possible to present all the results of the analysis, but typical trends are shown in Figures 1 through 3. Each point on a line represents a result obtained at a different combination of rotor speed and diameter.

Tensile properties of the yarns showed consistent trends with increasing centrifugal force. Elongation at break gave the best correlations, decreasing linearly with increasing centrifugal force for all machines, fibers and yarn numbers. Examples are given in Figures 1 and 2 which show results obtained from the Schubert & Salzer RU-11 and the Elitex BD 200S machines, respectively. Yarn strength also tended to decrease with increasing centrifugal force as demonstrated by the results obtained for N_e 5 yarns spun on the Rieter M1/1 machine (Figure 3). The rate of deterioration in count-strength-product for the polyester yarns was always higher than that for cotton. In many cases, the reduction in cotton yarn strength could be considered insignificant.

Trends in the non-uniformity values and hair count of the yarns with increasing centrifugal force were more complex, showing some dependence on rotor diameter and a lack of consistency between machines. It can be seen that the condition for constant centrifugal force is given by the simple relationship:

Rotor Speed x Rotor Diameter = Constant

Since the tensile properties of rotor-spun yarns appear to be dependent on centrifugal force alone, this equation can be used to determine different combinations of rotor speed and diameter which will give yarns of similar tensile properties. For example, yarns of similar strength and elongation can be expected if a machine having rotors of 66 mm diameter running at 36,000 rpm is re-equipped with rotors of 50 mm to be run at 48,000 rpm, or with rotors of 40 mm to be rotated at 60,000 rpm. This relationship should provide a useful starting point for evaluations of spinning performance in which different rotor sizes are to be compared.

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

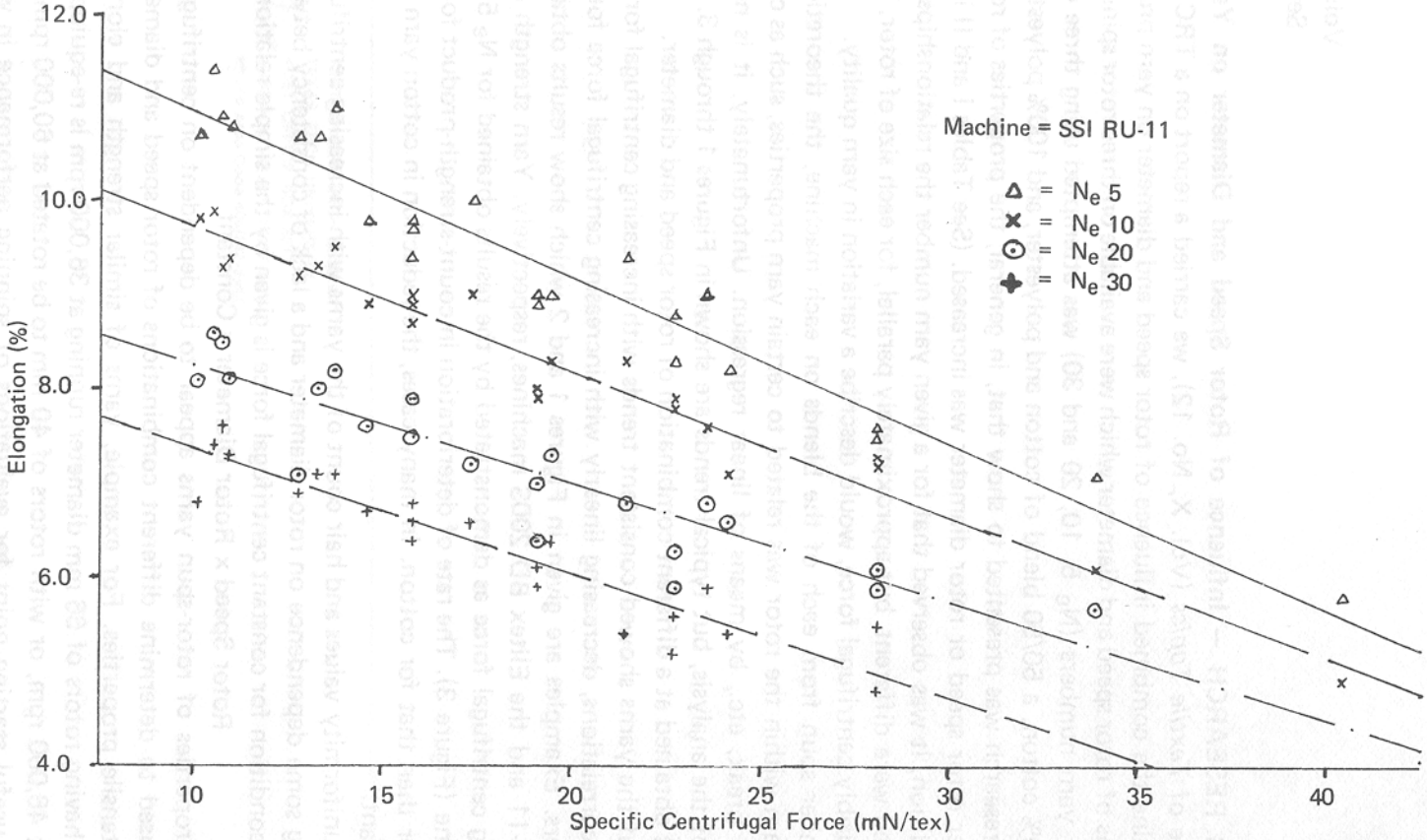

FIGURE 1

Elongation vs. Centrifugal Force for Cotton Yarns

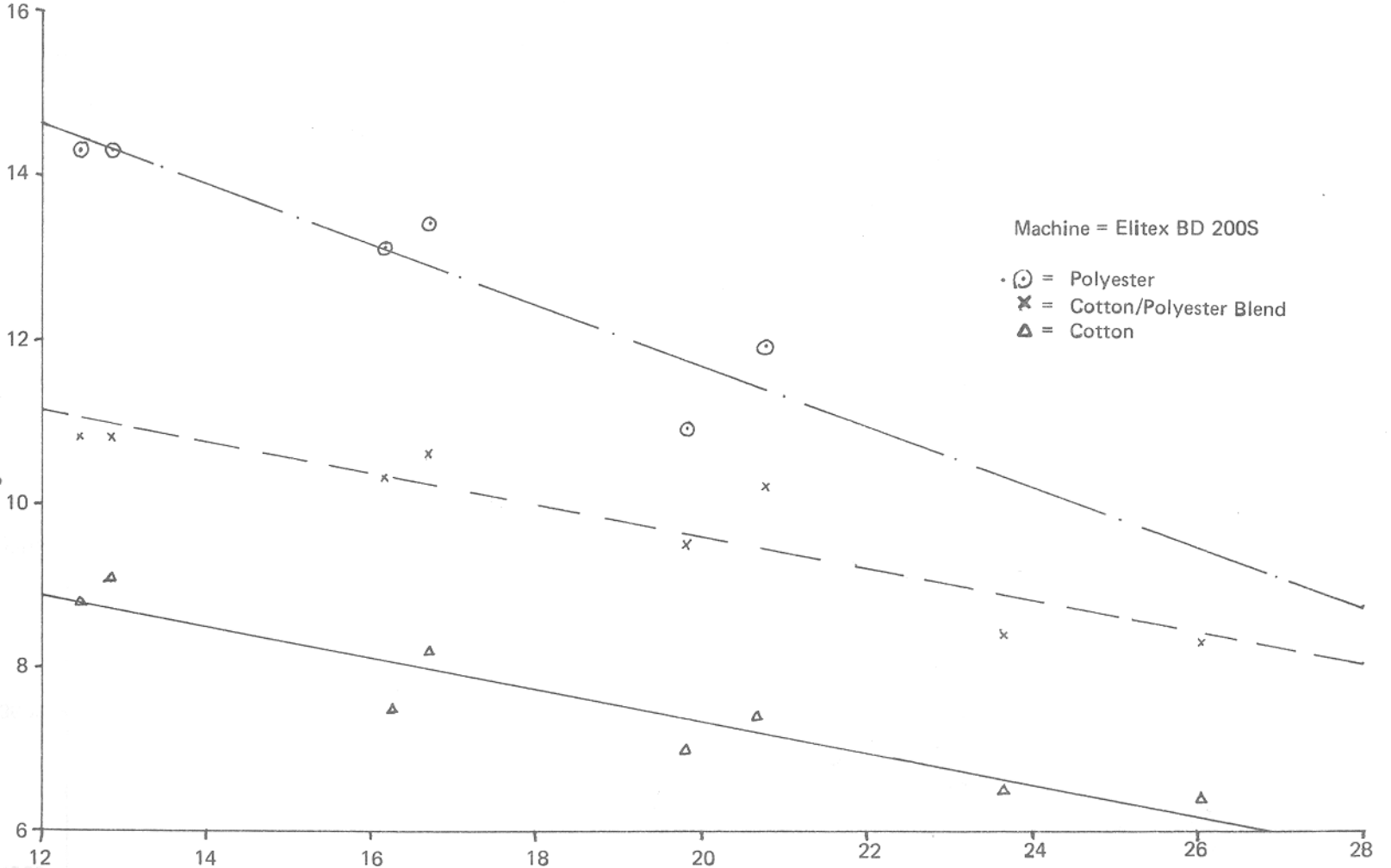

FIGURE 2

Elongation vs. Centrifugal Force (N_e 20 Yarn)

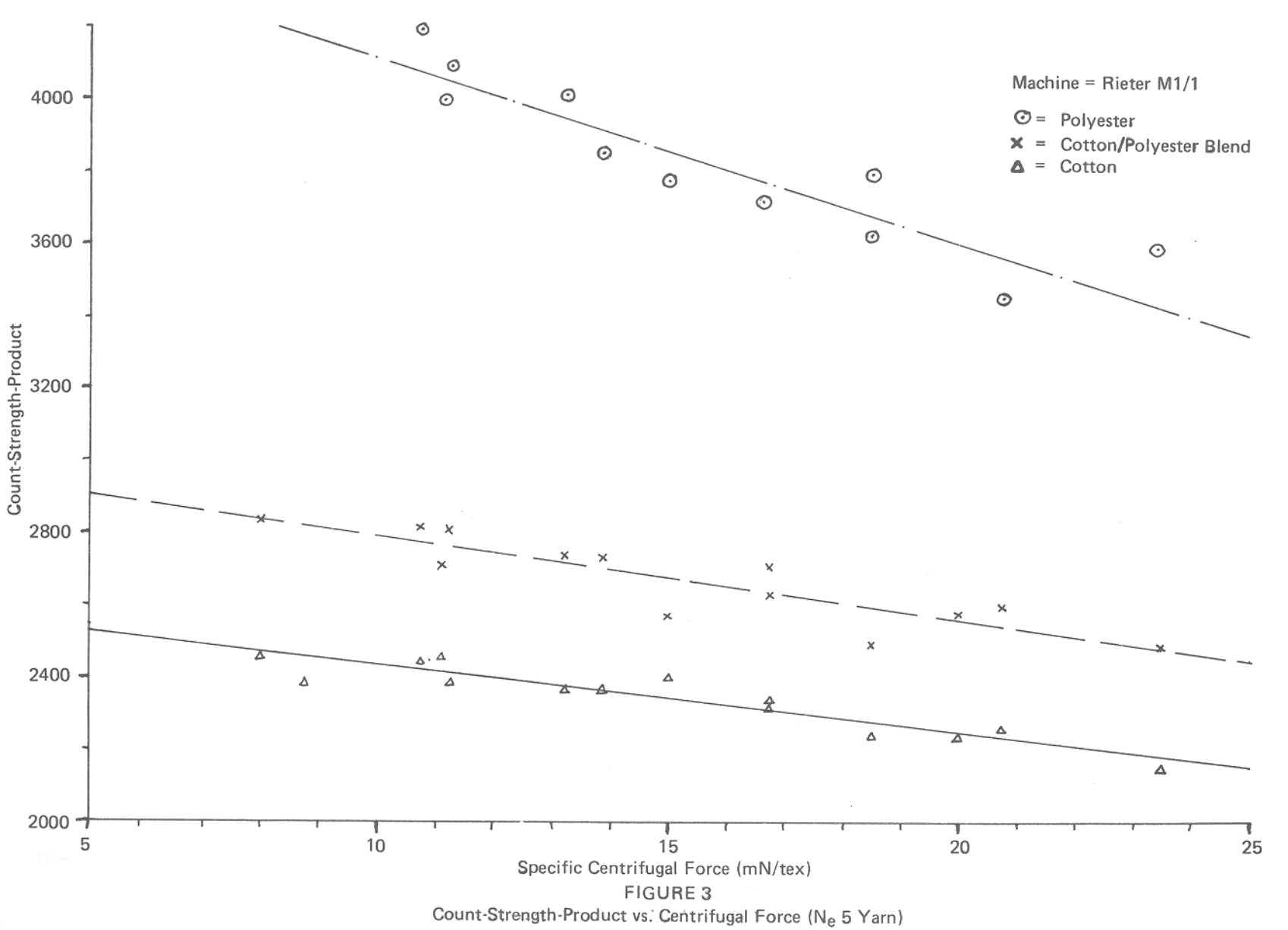

FIGURE 3

Count-Strength-Product vs. Centrifugal Force (N_e 5 Yarn)

TEXTILE STUDENT WINS COTTON COMPETITION Miss Dana Gonzalez, a student in the Texas Tech Department of Textile Engineering, was selected as the Texas South Plains Maid of Cotton in a contest held here recently. This event is sponsored each fall by the Lubbock Chamber of Commerce and attracts twenty to thirty contestants. The winner represents this area in the national Maid of Cotton competition, which is held in Memphis, Tennessee the last week of December and is sponsored by the National Cotton Council of America.

Miss Gonzales is an outstanding student, currently having a 3.3 grade point average, and is a scholarship recipient. We are pleased that one of our students has been selected for this honor. We extend to Dana our very best wishes for complete success in the national contest.

DEPARTMENT OF TEXTILE ENGINEERING Texas Tech University's Department of Textile Engineering is pleased with the quality of students enrolled at this time. Several freshmen and transfer students who have come to us from other universities and from other departments on the Tech campus have excellent academic records and have qualified for scholarships. These are awarded on the basis of an outstanding high school record or a minimum 3.0 grade point average on university undergraduate courses.

Students qualifying for scholarships this semester are Lori Rene Alread, freshman from Dallas, TX; Twila Braun, junior from Seminole, TX; Laura Cutshall, junior from Greeley, CO; Dana Gonzalez, junior from Amarillo, TX; Jane Kveton, senior from Abernathy, TX; Mary Ann Owen, junior from Tahoka, TX and Stacey Stone, freshman from Seminole, TX. Five of these scholarships are sponsored by the Textile Research and Scholarship Foundation of Texas, and two are funded by a textile chemical company.

VISITORS Visitors to the Textile Research Center during August included Elaine Powell, Governor's Budget Office, Austin, TX; Al Mika, Omintex, Charlotte, NC; Lester J. Smith, Cone Mills Corporation, Greensboro, NC; Roger Bolick, Allied Fibers & Plastics, Hopewell, VA; Kurt Masurat, George A. Goulston Co., Monroe, NC; Donald A. Sannes, McGraw-Hill Book Co., Austin, TX; Bill Roach, Llano Estacado Ranch, Caprock, NM; Bill J. Naarding, International Institute for Cotton, Hengelo, the Netherlands; Giel Steyn, Tongaat Cotton, Johannesburg, South Africa; Stelios Ayiotis, Tongaat Cotton, Kempton Park, South Africa; Ronald P. Roux and Broer Van Schalkwyk, Tongaat Cotton, Louis Trichardt, South Africa.