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# Effect of Yarn Characteristic on Yarn Tension during Unwinding from Package.

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# EFFECT OF YARN CHARACTERISTIC ON YARN TENSION DURING UNWINDING FROM PACKAGE

# "تاثير خواص الخيط على الشد اثناء سحبه من الكونة"

By: Shahin, A and Rakha, I

الخلاصة :

فى هذا البحث دراسة تاثير خواص الخيط (مزوى ، محرر ، محروق ، مبيض ، مصبوغ ومشمع) على التغير فى قيم الشد اثناء السحب المستمر للخيط من الكونة الثابتة بسرعة ١٠٠٠ م/ دقيقة وكذلك تم قياس معامل الاحتكاك لتلك الخيوط .. ووجد أن قيم الشد فى الخيط اثناء سحبه من الكونة تتغير تبعا لاختلاف التجهيز فى الخيط . بالنسبة للخيوط المزوية مثل ٢/١٠٠ ، ٢/١٦ تسبب اجهاد شد فى الخيط أثناء سحبة أكثر من الخيوط الفردية مثل ١/٥٠ ، ١/٨٠ أما بالنسبة للخيوط المرسرة والخيوط المشمعة وكذلك المحروقة تعطى اقل قيمة شد عن مثيلتها الخام . ولكن الخيوط المصبوغة والتى سبقت عملية الصباغة عملية تنظيف وتبييض فأعطت قيمة شد عالية نتيجة التاثير الكيماوى على سطح الشعيرات مما يعمل على تقليل نعومة سطح الشعيرات.

ABSTRACT - The object of this work was to study the influence of yarn surface finish on yarn tension during unwinding from package, the yarn tension was measured under the effect of different yarn characteristics such as:

- Doubled yarns
- Mercerized yarns
- Singed yarns
- Dyed yarns
- Bleached yarns
- Waxed yarns

It was found that the value of yarn tension related to the characteristics of the yarn surface. In order to ensure that these results are correct the coefficient of frictions for these different yarns were measured.

## INTRODUCTION

In some textile processes the yarn should be used with a special ch- such as dyed yarn, singed yarn, bleached yarn, mercerized yarn, doubl- yarn.

By withdrawing these yarns from stationary packages (s at a constant speed the characteristic of yarn surface influences t /1/, these yarn characteristics affect the coefficient of friction bet which varies the yarn tension. Hence, the variation in yarn tensio of textile processes such as warping, weaving and knitting.

According to /1/ the weft tension was measured on a sulzer weaving machine for a different weft yarn characteristics (waxed weft yarns and dyed weft yarns). It was found that the waxed weft yarn has a lower value of tension than the raw and dyed yarns.

According to the measurments stated in Ref /3/ many parameters affect on the coefficient of friction between yarn and guide, from among others, yarn twist, yarn speed, yarn tension, room temperature and relative heumidity.

In Ref/2/ the relationship between wax weight per unit length of yarn and its coefficient of friction was recoreded. Increasing the wax weight per unit length of yarn the coefficient of friction is decreased. However, if the wax weight becomes more than 0.7 gm per 10000 m yarn the coefficient of friction will not be changed.

In the present work an experimental study is carried out. During unwinding from stationary package at a high speed the effect of the following parameters on yarn tension are considered:

- yarn doubling
- yarn finishing (singed- mercerized- beleached- and dyed-yarns).

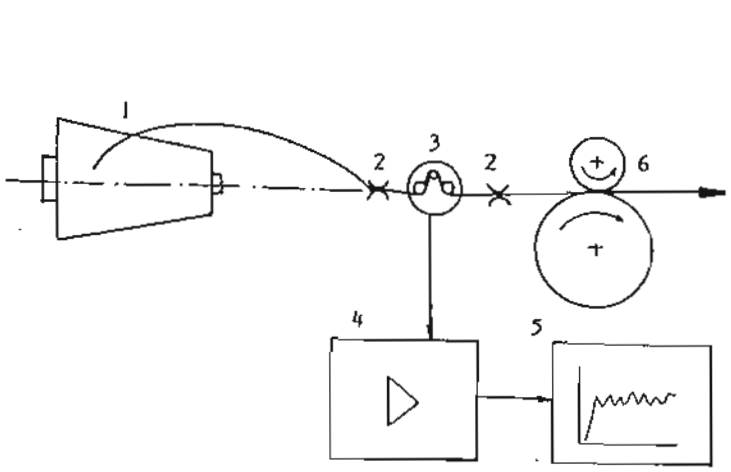
The coefficient of friction for all these yarns is also measured at different take up speeds (50, 150 and 250 m/min).

## EXPERIMENTAL WORK

Figure (1) shows the arrangement of the apparatus which is used to measure the yarn tension during unwinding the yarn of a speed 900 m/min from a stationary package. The signal from the measuring head (Rotschild) was amplified using an amplifier. The electric signal was calibrated in force units (cN) and recorded on a chart. The mean value of yarn tension was plotted against package diameter for different yarn characteristic.

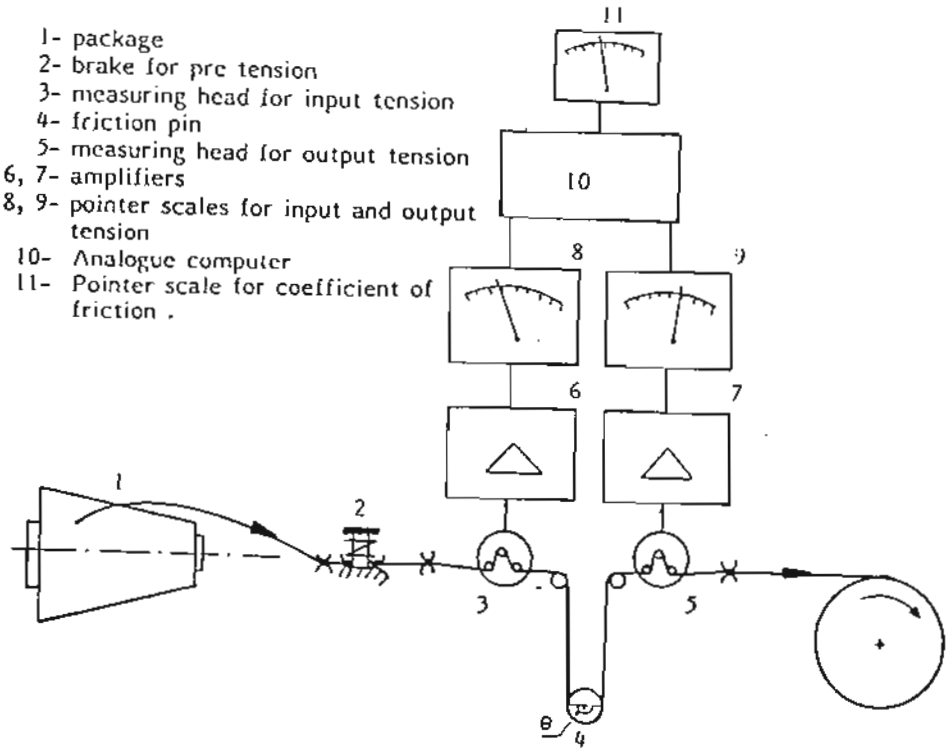
The electronic F-Meter from Rotschild was used to determine the coefficient of friction and its variability Fig. (2) shows the arrangement of the apparatus which is used to measure the coefficient of friction between yarn and friction pin. The two signals from measuring heads (3), (5) were amplified through amplifiers (6), (7) respectively. The amplified signals were recorded on a calibrated pointer scales in force units (cN), and we can regist the value of imput and output yarn tension directly. The signals are fed also to an analogue computer to solve the equation of fricition. After feeding the value of wrapping angle, the value for coefficient of friction can be recorded on a pointer scale in the apparatus.

Figs. (4, 6, 8 and 10) show the values for yarn coefficient of frication at different take-up speeds (50, 150 and 250 m/(min)




1- package
2- guides
3- measuring head
4- amplifier
5- chart recorder
6- withdrawing drums

Fig. 1: Measuring apparatus for yarn tension




1- package
2- brake for pre tension
3- measuring head for input tension
4- friction pin
5- measuring head for output tension
6, 7- amplifiers
8, 9- pointer scales for input and output tension
10- Analogue computer
11- Pointer scale for coefficient of friction .

Fig. 2: Principle of Rotschild F-meter

Specification of material used:

Table I shows the different types of cotton material (in form of conical packages) used and their characteristics.

Table I

| yarn count | yarn finishing |
|---|---|
| Ne 8/1 | raw - carded |
| Ne 16/2 | raw - carded |
| Ne 50/1 | raw - combed 17% |
| Ne 100/2 | raw - combed 20% |
| Ne 40/2 | raw |
| Ne 40/2 | singed |
| Ne 60/3 | singed-mercerized-dyed |
| Ne 40/3 | singed-bleached-dyed |
| Ne 40/3 | singed-mercerized-bleached |
| Ne 40/3 | singed-mercerized-waxed |

DISCUSSION

From our experiment we have found that, the double yarns have higher yarn tension than of the single yarns for the same linear density as shown in Fig. (3and5). The main reason for this difference comes from the change in friction between yarn and its guide during unwinding from package. Measuring the coefficient of friction for these yarns, it was found that the double yarn has higher coefficient of friction than of the single yarns, this is due to the irregular circularity of yarn cross-section for double yarns, beside that the air resistance for double yarn through its flying in the rotating balloon is higher than the value of air resistance for single yarn, see Figs. (4 and 6).

Figure (7) shows the effect of yarn finishing on its tension. It was found that the raw yarn (Ne 40/2) has higher tension than of the singed yarn (Ne 40/2). This difference in yarn tension is due to the hairniss of yarn. In order to ensure that these results are correct the coefficient of friction for these yarns were measured. It was found that the raw yarn has higher coefficient of friction than of the singed yarn, see Fig. (8). However the mercerized-, dyed-yarn (Ne 60/3) has lower yarn tension and coefficient of friction than those of the raw yarn (Ne 40/2) and singed yarn (Ne 40/2). This is due to the improvements of the degree of smoothness for yarn surface through the mercerization process, see Fig. (7).

As shown in Fig. (9) the singed-mercerized-waxed-yarn and singed-mercerized- bleached-yarn have lower tension than the singed-bleached-dyed-yarn. This is due to the improvemebts of the degree of smoothness for yarn surface through the mercerizing and waxing process.

In case of singed-bleached-dyed-yarn (Ne 40/3-vat dyes) the yarn was scoured and bleached before dying process. These processes before dying leads to a damage in the surface of cotton fibre and lost its smoothness /5/. Measuring the coefficient of friction for these yarns, it was found that the dyed yarn has higher coefficient of friction tham those of the other two yarns, see Fig. 10.

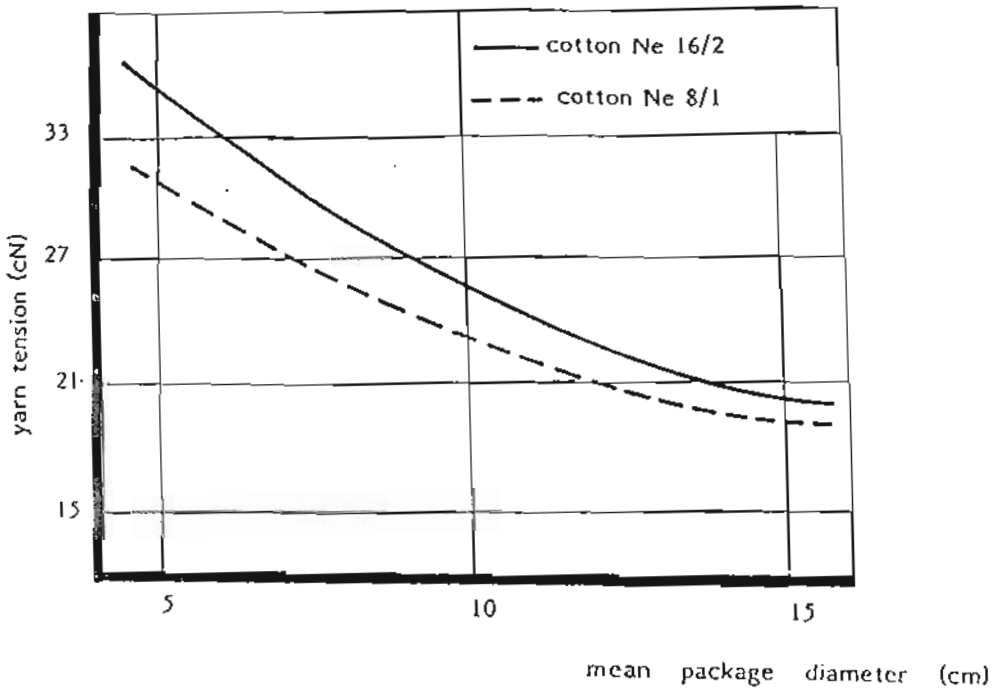



Fig. 3 package diameter versus yarn tension

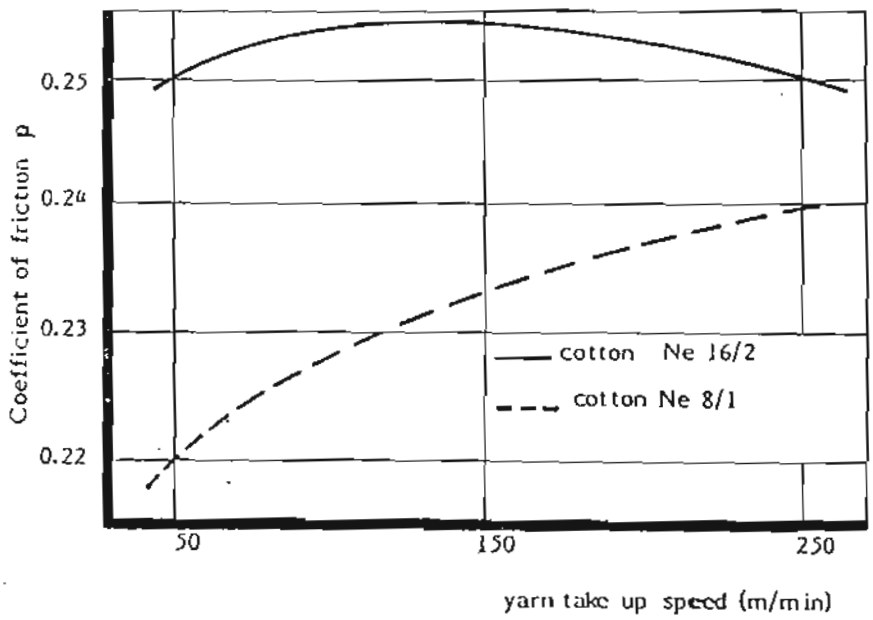



Fig. 4 : Yarn take up speed versus coefficient of friction

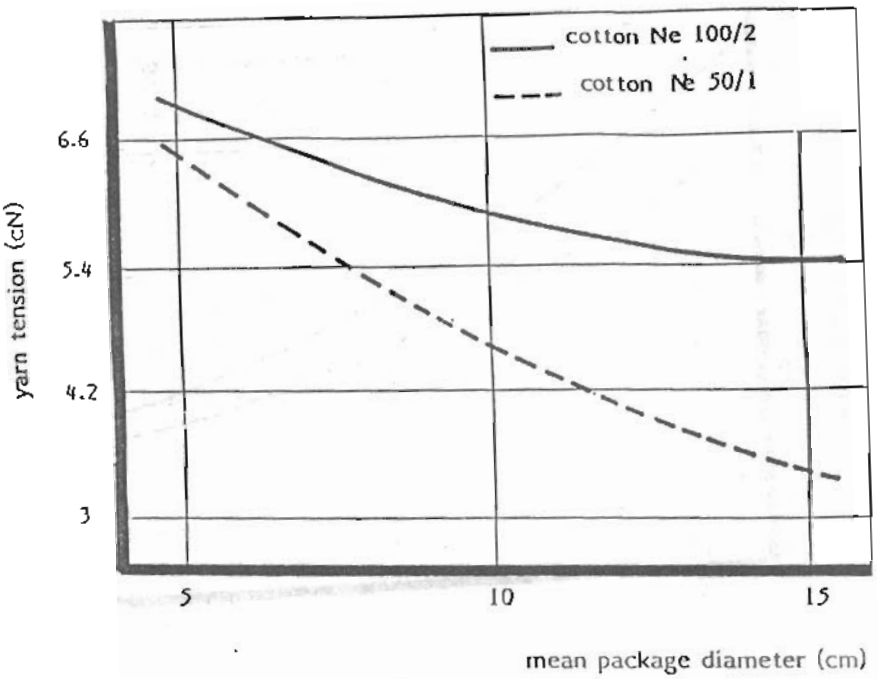



Fig.5 : package diameter versus yarn tension

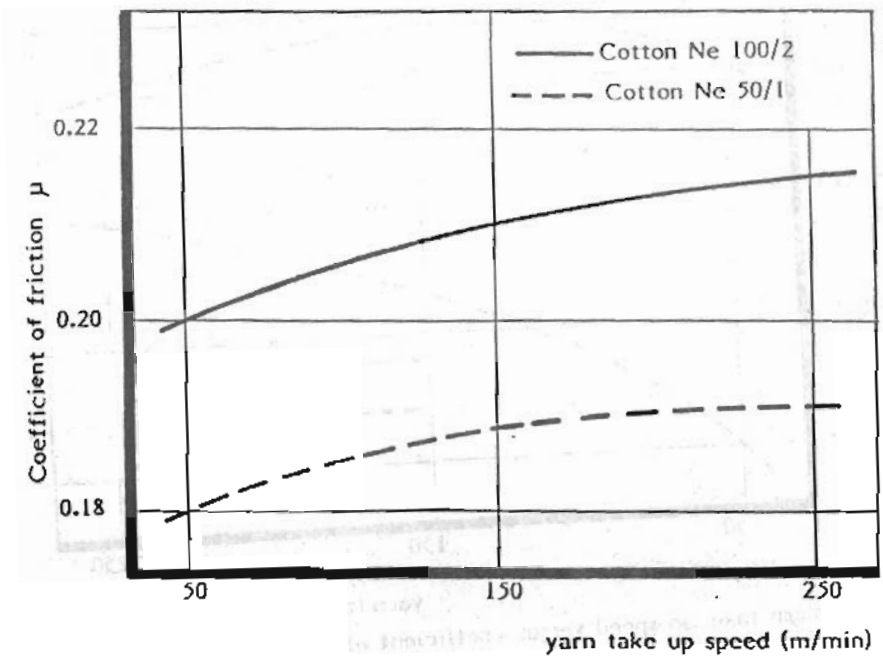



Fig.6 : Yarn take up speed versus coefficient of friction

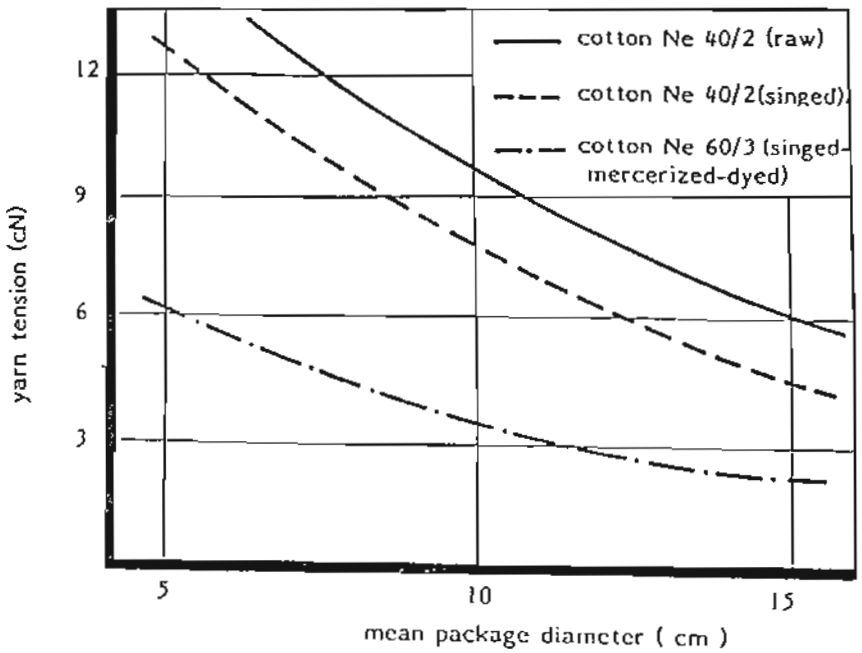



Fig. 7 : Package diameter versus yarn tension

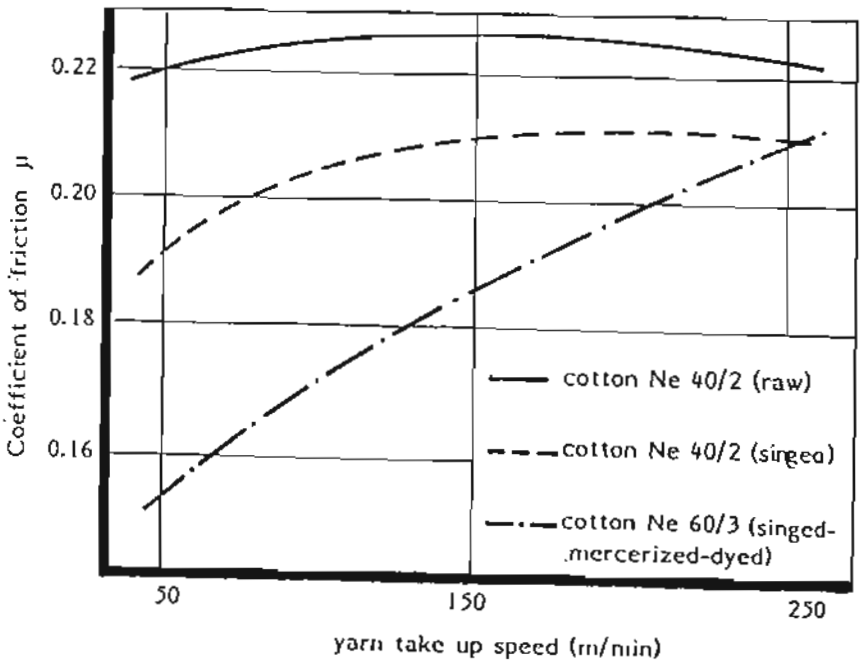



Fig. 8 : Yarn take up speed versus coefficient of friction

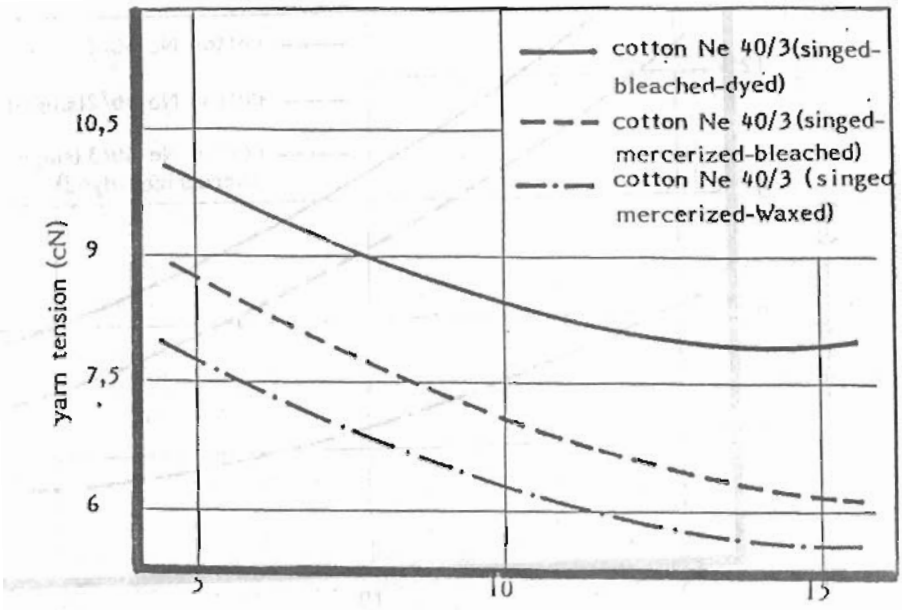



Fig. 9 : Package diameter versus yarn tension

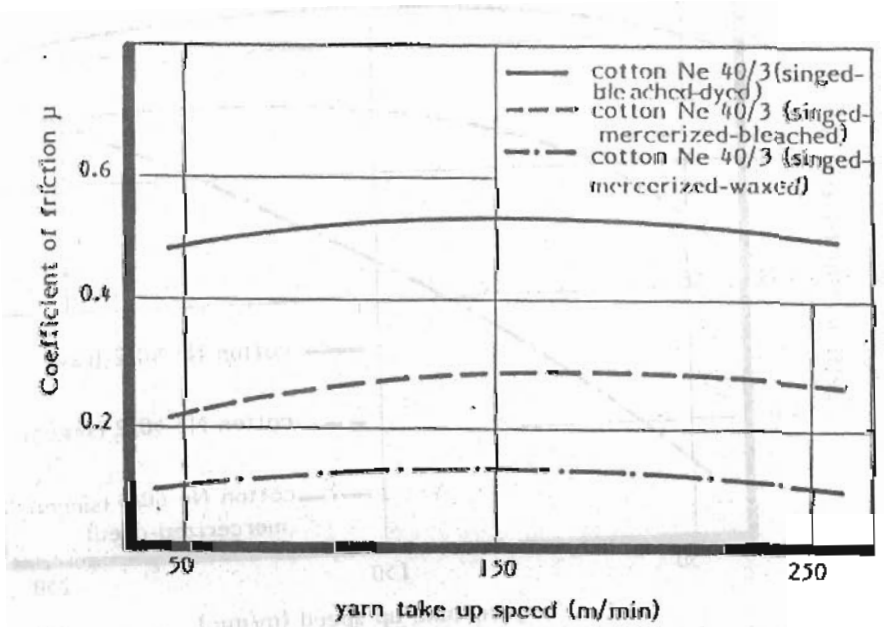



Fig. 10 : Yarn take up speed versus coefficient of friction.

## CONCLUSION

- The value of yarn tension increases with increasing the coefficient of friction. In general the coefficient of friction is affected by the yarn characteristic.
- During the operation of multi weft yarn on the shuttleless looms it is better that their characteristics must be nearly the same, atherwise the efficiency of the weaving machine and fabric quality will be effected.
- In order to avoide the tension differences between yarns with different characteristics during the warping process, a selfbalancing yarn brakes must be used. Then the loom efficiency and fabric quality will not be effected.

## REFERENCES

/1/ Lvitz, Eigenheiten des Schussfadenabzuges Melliand Textilberichte 10/1979 P. 845

/2/ Textil Praxis 2/1973 P. 77

/3/ Wegener W. Die Bestimmung des statischen Reibungskoeffizienten Textil Industrie 4, 5, 6/1964 P. 250 and 9/1965 P. 691

/4/ ASTM, standard test method for coefficient of friction, yarn to metal D 3108-76

/5/ L. Rebenfeld, "Response of cotton chemical treatments, T.R.J. 1961, Vol. 31, No. 3 part II .