The Physical Properties of Fluffy Yarn by ATY Texturing

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1. INTRODUCTION

One of the representative techniques used to make cotton-like yarn is fluffy yarn texturing technique. This technique is to texture fluffy yarn in the way of randomly cutting each composed filament after connecting filament yarn in an appropriate way. To cut the composed filament, we usually use three methods:(i)cutting of friction causing in two yarns, (ii)cutting of air spraying by using strength difference, and (iii) cutting of air spraying by orientation difference.

Even though techniques of texturing DTY, ITY, ATY, TTY and so on have well been developed in the domestic, fluffy yarn texturing technique still has not been developed in an appropriate level.

Therefore, this research is to focus on providing fundamental data for on-the-spot industrial fields after researching physical properties by developing fluffy yarn material like natural cotton-like fluffy yarn which makes up for its defective property and utilizes its merits.

2. EXPERIMENTAL

2.1 Cotton-like texturing by using ATY machine

To develop fluffy yarn which has a function of moisture absorption, we textured 150d/228f ATY fluffy yarn by using + type shaped (50d/36f, DTY) and 100d/192f FDY provided by S company. We used ATY machine for raw material texturing. In this process, we used + type shaped (50d/36f, DTY) as core yarn and 100d/192f FDY as effect yarn, respectively. Texturing was performed under the conditions of yarn speed 300m/min, air pressure 11kg/cm^2, and over feed -7%. Figure 1 shows air texture machine scheme for raw material texturing,

2.2. Physical property

2.2.1 Shrinkage rate

The samples prepared were soaked in boiling water for 15 minutes, and heated in dry air 100, 120 140, 160, 180℃ for 5, 10, 30 and 60 min, respectively. After this process, the shrinkage rates were measured.

2.2.2 Strain and stress

The initial modulus, tenacity and elongation values were measured by using S-S curves measured by UTM (U.K., Hounsfield).

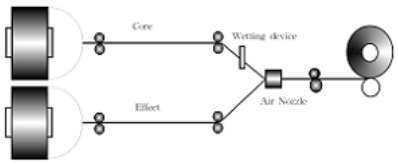


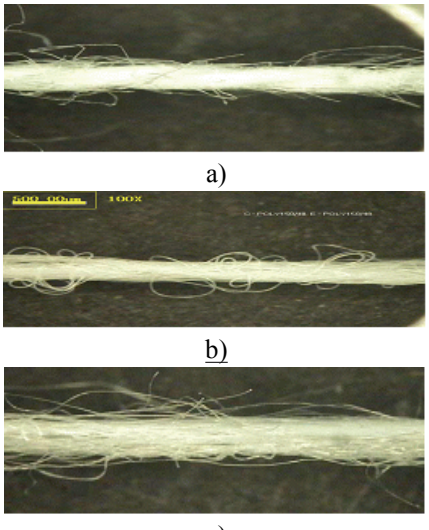
Fig. 1. Scheme of ATY machin.

2.2.3 Strain and stress

The initial modulus, tenacity and elongation values were measured by using S-S curves measured by UTM (U.K., Hounsfield).

3. RESULTS AND DISCUSSION

While the surface of ATY machine-textured yarn is shown in (b), the surface form of textured yarn(c) is very similar to that of natural cotton(a)..



a)

b)

c)

Fig. 2. Photograph of fiber surface.
a) Natural cotton yarn
b) ATY textured yarn
c) Development of fluffy yarn

The shrinkage ratio of the samples treated in 120℃ resulted in about 7%, but that in 180℃ resulted in about 11%. There is no influence on the shrinkage in treatment time

The higher the treatment temperature becomes and the longer the treatment time gets, the lower elongation becomes. If the temperature is in 180℃, treatment time is more influential on elongation. The result showed that temperature is more influential than treatment time. Following that, there was about 8% difference between the two conditions: (i) treatment time 5 minutes and temperature 180℃ produced about 23% and (ii) treatment time 5 minutes and temperature 120℃ about 15%, respectively. In 180℃, treatment time 5 minutes produced 23%, but treatment time 60 minutes showed 19%. That is, there was just 4% difference in time adjustment.

Tenacity increased when temperature was higher and time was longer, but temperature was high. Tenacity in 30 minutes and 180℃treatment condition resulted in 0.025kgf/d, but that in 120℃ treatment was 0.021kgf/d.

The change of initial modulus is similar to that of tenacity. Initial modulus in 30 minutes and 18 0℃treatment condition resulted in 0.7kgf/d, but that in 120℃ treatment was 0.63kgf/d.

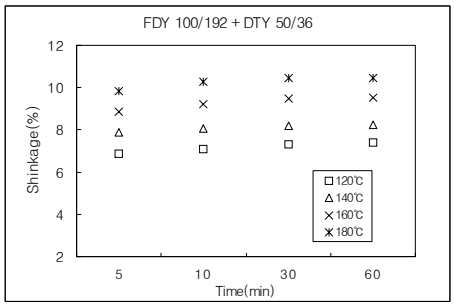


Fig. 3. Shrinkage vs. treated time at various temperature

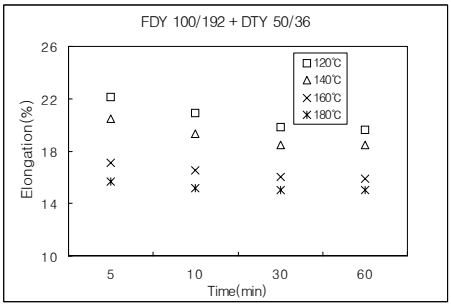


Fig. 4. Elongation at Max. vs. treated time at various temperature

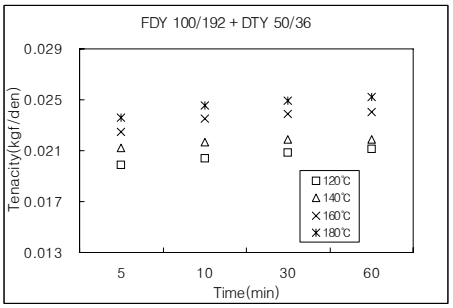


Fig. 5. Tenacity vs. treated time at various temperature

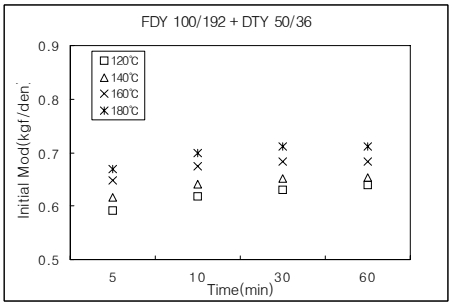


Fig. 6. Initial modulus vs. treated time at various temperature

4. CONCLUSION

1) The shrinkage ratio of the samples treated in 120℃ resulted in about 7%, but that in 180℃ resulted in about 11%. There is no influence on the shrinkage in treatment time
2) Tenacity increased when temperature time is longer and temperature is high. Tenacity in 30 minutes and 180℃treatment condition resulted in 0.025kgf/d, but that in 120℃treatment was 0.021kgf/d.
3) Fluffy yarn with moisture absorption by using ATY machines shows that the change of initial modulus is similar to that of tenacity.
4) The change of Initial modulus shows that 180℃ treatment and 30 minutes resulted in 0.7kgf/d.