STUDY ON THE EFFECT OF FRIEZE PROCESS ON PHYSICAL AND CRIMP PROPERTIES OF BCF POLYPROPYLENE YARN

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ABSTRACT

Today BCF Polypropylene (PP) yarn is used in machine made carpet as pile yarn. This yarn is subjected to heat setting process together with Frieze treatment for creation of resiliency and special effects. The aim of this research was to investigate the physical and crimp properties of BCF PP pile yarns subjected to Frieze treatment process. In this research,according to the experimental analysis design carried out by Design Expert software, the level of 3 parameters including, temperature of heat setting, vapor pressure and over feed ratio of Frieze process are determined.

Regarding to the obtained results by Design Expert software, 14 kinds of Frieze yarn sample along with a control yarn is produced. The physical properties of yarns including: linear density, shrinkage, crimp contraction are measured. Analyzing the experimental results shows that increasing the temperature of heat setting causes linear density and crimp contraction to be increased but shrinkage decreased.

Key Words: Heat setting - PP BCF yarn - Frieze Process

1. INTRODUCTION

Heat setting is a thermal process that results in dimensional stability of fibers, yarns or fabrics, and in most cases, other desirable properties, such as higher volume, resistance to wrinkling or thermal resistance, are obtained.[1]

The heat setting process apply a heat treatment on the fibers at certain temperatures above their glass transition temperature, resulting changes in the lumbar crystallization, new arrangement of chains, and the like. This redesign in a new form is stored as soon as the fiber cools down like a memory in the fiber. These changes to the internal structure of the fibers lead to changes in their properties, such as dyeing properties, crimp properties (reversibility, volumetric characteristics, etc.), stabilization of the rolling stock and so on [2].

Today, two widely used machines are used for heat setting process, Sussen (Power Heat set) and Superba [3].

Power Heat set machines are hot-dipped machines, while the superba is powered by a steam-powered heat system [3].

The heat setting operation of the BCF yarns can be applied as a final process on the yarn, with the aim of improving the resilience and appearance of the carpet woven by these yarns [4].

Sarcelick et al, worked on the heat setting effect of polypropylene BCF yarns. They concluded that as a result of heat setting, the mechanical properties of the yarn, such as specific strength, modulus, bending stiffness and other properties such as shrinkage, were reduced [4].

2. EXPERIMENTAL

2.1 Material

In this work, BCF polypropylene pile yarn (144 filament with the count of 2000dtex) was used.

2.2 Pile yarn Frieze processing

In this research for change the level of 3 parameters including, temperature of heat setting, steam pressure and over feed ratio of Frieze process, the experimental analysis design carried out by Design Expert software. Regarding to the obtained results by Design Expert software, 14 types of Frieze yarn samples are designed and produced along with a control yarn as shown in Table1.

Table 1. Results of Design Expert Software to maintain parameters level

Yarn sample	Temperature (˚c)	steam pressure(bar)	Over feed (%)
1	110	1.5	14
2	110	1.5	26
3	110	2.6	14
4	110	2.6	26
5	120	1.0	20
6	120	2.0	10
7	120	2.0	20
8	120	2.0	30
9	120	3.0	20
10	130	1.5	14
11	130	1.5	26
12	130	2.6	14
13	130	2.6	26
14	130	2.0	20
control	120	1.8	20-

3. RESAULT AND DISCUSSION

The results of yarn properties, including the linear density, shrinkage and crimp contraction are illustrated in Figures 1 to 3.

As shown in Figure 1, increasing the temperature of heat setting causes linear density and crimp contraction, to be increased whereas the shrinkage to be decreased. It seems likely that when the number of crimps within a fixed length is increased and as a consequense the yarn weight and hence yarn linear density is increased.

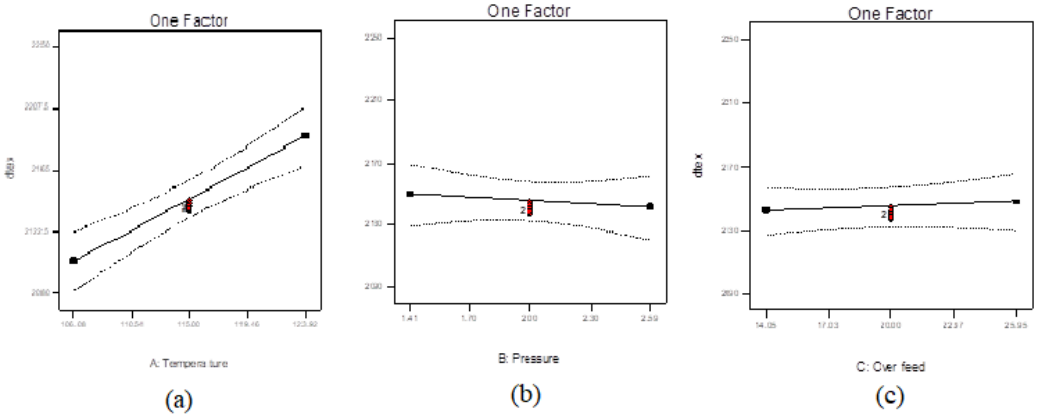

Figure1.The effect of heat-setting temperature (a), steam pressure (b) and over feed ratio (c) on the linear density.

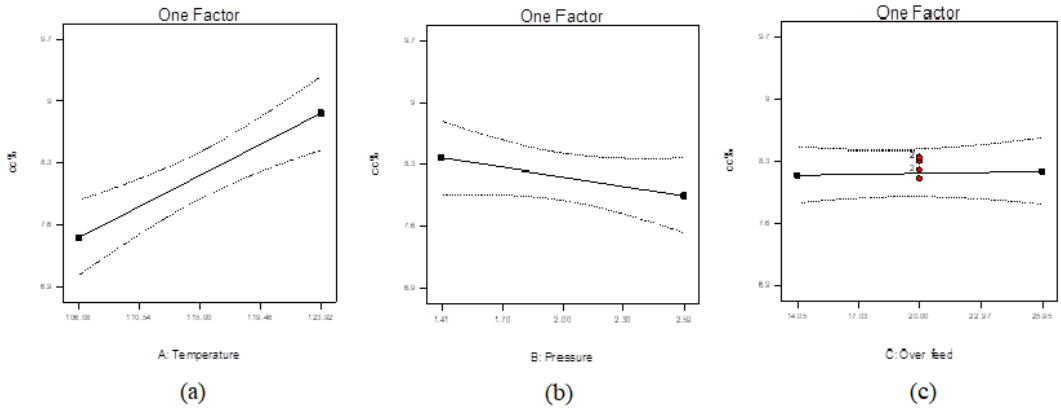

Figure2. The effect of heat-setting temperature (a), steam pressure (b) and over feed ratio (c) on the crimp contraction.

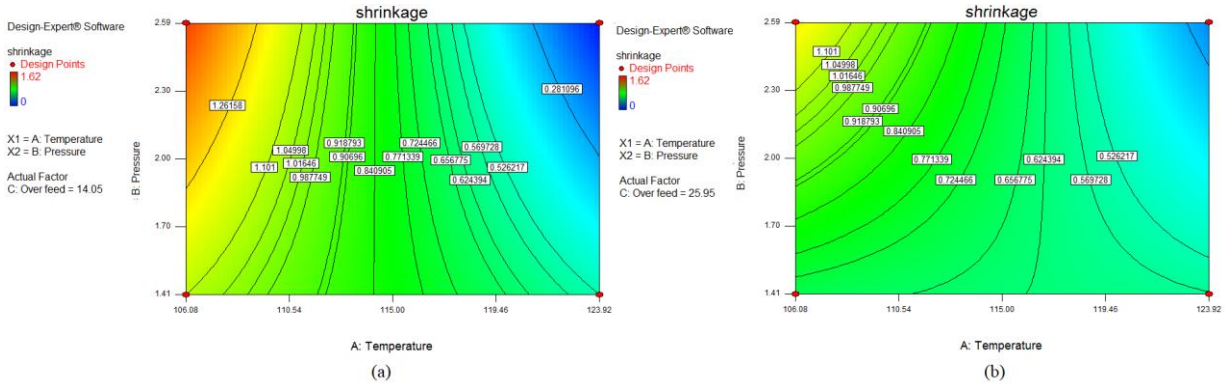

Figure3. The pressure curve in terms of heat-setting temperature in a constant minimum (a) and maximum (b) amount of over feed tatio on the shrinkage.

3. CINCLUSION

The results of the measurements show that, with increasing of heat setting temperature, the amount of linear density and crimp contraction increase, while the yarn shrinkage decreases.

4. REFERENCES

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