

# The Effects of Processing Conditions of Belt Texturing Machine on the DTY Physical Properties

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## Abstract

This research surveys the effects of POY physical properties and processing conditions of belt texturing machine to the draw textured yarns. The various textured yarns are made with variation of 1st heater temperature, draw ratio and velocity ratio, and the physical properties of these specimens such as yarn linear density, tensile properties and wet and dry thermal shrinkages are measured and analyzed with POY physical properties and processing conditions of texturing machine. Especially yarn mechanical properties of DTY are analysed with the variation of untwisting tension ( $T_2$ ) on the untwisting part in DTY process and thin and thick DTY yarn model are proposed with surging phenomena in DTY process.

## Introduction

There are three types of texturing apparatus in the false twist texturing method. It is well known that what conditions in the texturing process are optimum for the good draw textured yarns<sup>1)-3)</sup>. Recently, it is known that new textured yarns are being made under the conditions except the optimum. This research surveys the effects of POY physical properties and processing conditions of belt texturing machine to the draw textured yarns. The various textured yarns are made with variation of 1st heater temperature, draw ratio and velocity ratio, and the physical properties of these specimens such as yarn linear density, tensile properties and wet and dry thermal shrinkages are measured and analyzed with POY physical properties and processing conditions of texturing machine.

## Experimental

Table 1 shows the physical properties of PET POY which is used in texturizing process. Table 2 shows processing conditions which are changed for making specimens on the Muratec 33H<sup>+</sup>

texturizing machinery. Fig. 1 shows the schematic diagram of 33H<sup>+</sup> Muratec texturizing m/c. The physical properties such as yarn denier, tensile properties and wet and dry shrinkages were measured and analysed.

Table 1. The physical properties of PET POY 250d/48f

	Denier (d)	Initial Modulus (g/d)	Tenacity (g/d)
POY A	250.9	1.27	2.75
POY B	254.9	1.07	2.66
	Breaking Strain (%)	Dry shrinkage	Wet shrinkage

Table 2. False twist processing conditions

Fixed conditions	
Yarn speed (m/min)	500
1st over speed (%)	2.11
2nd over speed (%)	3.50
Belt cross angle (°)	115
Varied processing conditions	
1st heater temperature (°C)	160, 180, 200, 220
Draw ratio (DR)	1.5, 1.6, 1.7, 1.8, 1.9
Velocity ratio (VR)	1.4, 1.5, 1.6, 1.7, 1.8
Total specimen no.	100

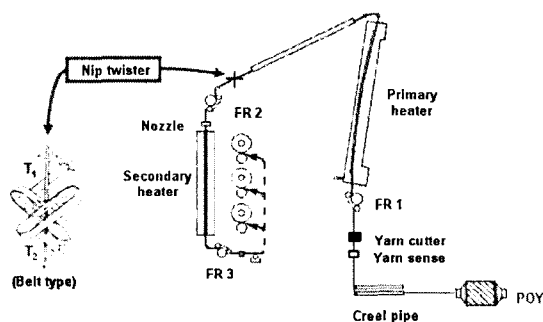


Fig. 1 Texturing m/c of Muratec

## Results

### 3.1. Denier of DTY filament to the process conditions

Filament deniers of DTY are decreased with draw ratio, and there are no significant changes with 1st heater temperature and velocity ratio.

### 3.2. Tensile properties of DTY to the process conditions

Tenacity is increased with draw ratio, and there is no significant change with velocity ratio but tenacity is affected with 1st heater temperature. Initial modulus is also increased with draw ratio and there are no significant changes with velocity ratio and 1st heater temperature. But, under low draw ratio, it is affected with velocity ratio and 1st heater temperature.

### 3.3. Wet and dry shrinkages of DTY to the process conditions

Fig.2 shows dry shrinkages of POY B with various process conditions and Fig.3 shows wet shrinkages of POY B with various process conditions. In Fig.2, the dry shrinkages of DTY are increased with draw ratio and decreased with 1st heater temperature. And the dry shrinkages are decreased with velocity ratio under low draw ratio (1.5, 1.6, and 1.7), and then, under high draw ratio (1.8 and 1.9), are slightly increased with velocity ratio. The wet shrinkages as shown in Fig. 3 show also the same phenomena as the dry shrinkages.

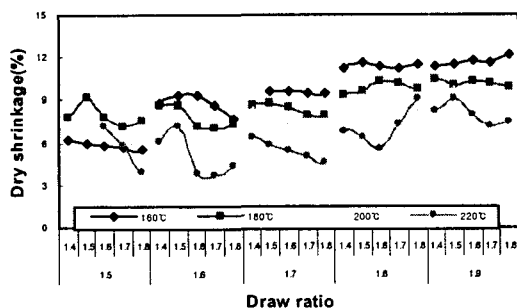


Fig. 2 Dry shrinkage of DTY according to processing conditions

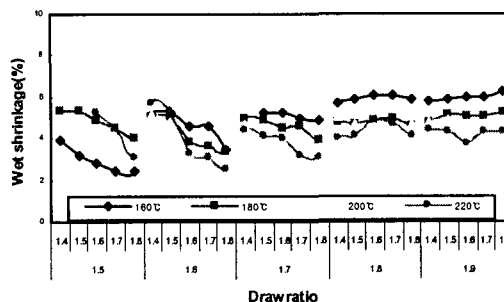


Fig. 3 Wet shrinkage of DTY according to processing conditions

## Conclusions

The physical properties of DTY with draw ratio, velocity ratio and 1st heater temperature are measured and analysed in this study. Various phenomena not accessible in the normal conditions such as recommended data from the texturing machinery company were obtained.

## References

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