STUDY OF FRICTION FORCES IN SPINNING YARN FROM POLYESTER AND WOOL FIBER SLIVERS USING AN IMPROVED DRAWING APPARATUS ON A RING SPINNING MACHINE

A.P.Pirmatov
S. N. Yarashov
Tashkent Textile and Light Industry Institute

Abstract. *Friction forces were studyed in adjustment of polyester and wool fiber yarn with different characteristics for spinning in spinning machine stretching device*

Keywords: *polyester, riffles, cylinder, fibers, wool, force*

INTRODUCTION

The peculiarity of the proposed roving drawing device is that in the third output pair, the cylindrical riffles extend the polyester and wool roving at an angle, mixing them together and forming a two-component yarn.

When polyester and wool fibers interact with inclined riffles, the components of their axial tensile force appear, allowing the fibers to be mixed together. In this case, it is important to study the influence of the properties, friction forces, deformation properties, and stiffness of polyester and wool fiber roving.

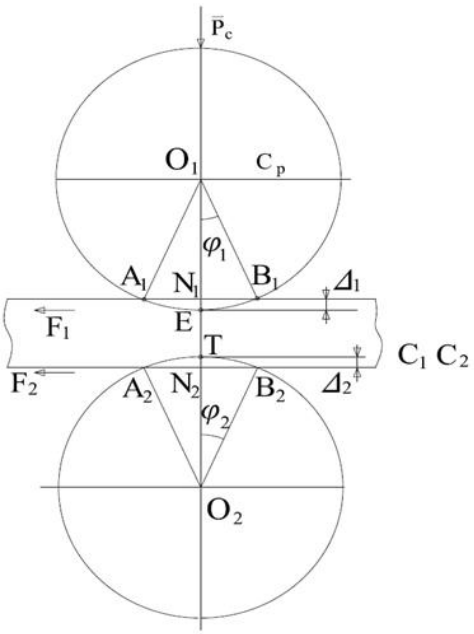

Figure 1. Calculation scheme for the interaction of the third pair of elements of the stretching device

Figure 1- shows the total friction force according to the calculation scheme [1,2]

$$\bar{F}_{um} = \bar{F}_1 + \bar{F}_2 \qquad (1)$$

where: $\bar{F}_1$ is the friction force between the output crushing roller and the stretching sheet; $\bar{F}_2$ is the friction force between the output corrugated cylinder and the sheet [3].

According to the calculation scheme, the friction force between the pile with polyester fibers and the discharge roller is:

$$\bar{F}_1 = f_1(\Delta_1 C_1 + \Delta_p C_p - g(m_p + m_b)) \qquad (2)$$

Friction force created by wool fiber roving:

$$F_1' = f_1'(\Delta_1' C_1' + \Delta_P' C_p - g(m_p + m_b)) \qquad (3)$$

Correspondingly, the friction forces between the grooved cylinders producing these rovings are:

$$F_2 = f_2[\Delta_2 C_P + g m_p'] \qquad F_2' = f_2'[\Delta_2' C_1 + g m_p'] \qquad (4)$$

where C_1, C_1', C_P are the stiffness coefficients of the stretched polyester and wool fiber roving, as well as the elastic coating of the pressing roller; $\Delta_1, \Delta_1', \Delta_p, \Delta_P'$, - corresponding deformations of polyester and wool roving, as well as the elastic coating of the pressing roller;

f_1, f_1', f_2, f_2' - coefficients of friction between polyester and wool roving with a rifted cylinder and a pressing roller; g - acceleration of free fall, m_p, m_b - masses of the axis and elastic coating of the pressing roller; m_p'-mass of the rifled cylinder; Δ_2, Δ_2'- values of deformation of polyester and wool roving when interacting with a rifted cylinder.

According to the calculation scheme accordingly $\Delta O_1 B_1 N_1$ va $\Delta N_2 B_2 N_2$

$$\Delta_1 = R_1(1 - \cos\varphi_1); \Delta_2 = R_2(1 - \cos\varphi_2) \qquad (5)$$

From the obtained expressions, we can determine the friction forces during the drawing and blending of slivers containing polyester and wool fibers in the drawing device. In this case, the mixing of the slivers directly depends on the values of the deflection angles of the corrugated cylinder slivers.

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