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Study Of The Influence Of The Parameters Of The Sampling Zone On The Condition Of The Capture Of Fibers By The Drum Teeth

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ABSTRACT

The article presents and discusses the results of determining the diameter of the sampling drum on the basis of theoretical research and substantiating the rational parameters of the system for hanging the fibers of the discrete drum headset in the sampling zone of the pneumatic mechanical spinning machine. The forces of interaction between the garniture teeth and the fibers were studied, and the effect of the sampling process on the productivity and quality parameters of the fibers was analyzed. Based on the research, graphical connections were obtained, these graphs were analyzed, and optimal parameters were determined. The results of theoretical studies on the determination of the diameter of sampled drum and justify the rational parameters of the system.

KEYWORDS

Fiber, sampling, sampling drum, friction force, angle, speed, radius, sampling zone.

INTRODUCTION

During the sampling process, fiber extraction occurs under certain conditions. Let's consider this condition. In fig. 1 shows a design scheme for determining the capture of a single fiber by the tooth of a sampling drum.

During the extraction of fiber from the sliver during sampling, the following forces act on it; force of inertia $(\overline{m\ddot{x}})$; weight force $(\overline{G})$; friction force of the fiber on the front face of

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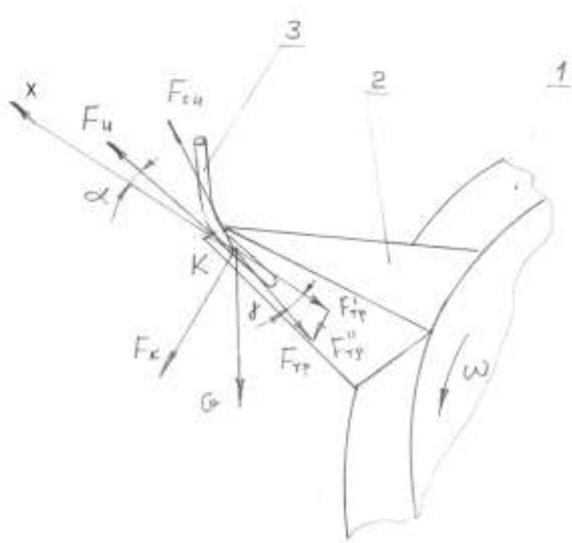
the sampling drum tooth ($\overline{F}_{mp}$); adhesion force of the fiber to the bulk in the beard ($\overline{F}_{cц}$); portable inertia force ($\overline{F}^{u}{}_{n}$); Coriolis force of inertia ($\overline{F}_{кор}$).For the relative motion of the fiber (center of mass) along the front face of the sampling drum tooth, we can write the equation [1]:

$$m\ddot{x}_{отн} = \overline{G} + \overline{F}_{mp} + \overline{F}_{cц} + \overline{F}^{u}_{пер} + \overline{F}_{кор} \quad (1)$$

Where, m is the mass of the fiber; $\ddot{x}_{отн}$ - acceleration of the fiber center of mass in relative motion [4].

In the process, the teeth of the sampling drum must be removed from the fiber belt and carried away with the fibers. This requires the absence of relative movement of the fiber along the front edge of the teeth of the sampling drum. ($X_{осm} = 0$). Besides.



Where, 1-sampling drum, 2-sampling drum tooth, 3-fibers.

Figure: 1. Forces acting on the fibers when they are pulled from the fibrous tape by the tooth of the sampling drum in the spinning machine.

Coriolis force ($F_{кор} = 0$, for relative motion always $\ddot{x} = a_{кор} \perp V_{jny}$) [1,2].

THE MAIN FINDINGS AND RESULTS

Taking the projections from all forces acting on the fiber on the X-axis and after some transformations, taking into account the above, it is possible to determine the condition for ensuring the pulling of the fiber from the fiber tape in the sampling zone with the teeth: from this condition, we determine the required diameter of the sampling drum or the point of location of the center of mass of the fiber on the front face of the tooth from the axis of rotation

$$D \le \frac{2\left[mg(\cos\varphi + f\cos\gamma) - F_{cц}\cdot\cos\theta\right]}{m\omega^2\cos\alpha} \quad (2)$$

To study the influence of the parameters of the sampling drum on the values of its diameter, the problem was solved numerically. At the same time, for the initial values of the parameters we chose: $m = 3.0\cdot10^{-6}\ кг$;

$F_{cц} = 0{,}08гр; g = 9{,}81\ {м}/{c}$; $\omega = 628\ {рад}/{c}$;

$f = 0.32$ $\gamma = 15^0$; $\theta = 85^0$; $\alpha = 75^0$ $\varphi = 20^0$

It should be noted that increasing the diameter of the sampling drum allows an increase in the linear velocity of the fibrous material. But, at the same time, the inertial indicators of the sampling drum increase, which can lead to undesirable phenomena during sampling [3].

Based on the study, graphical dependences of the change in the diameter of the sampling drum on its angular velocity were obtained, which are shown in Fig. 2a. With an increase in the angular velocity of the sampling drum, its diameter decreases linearly.

According to [5], as well as by analyzes, it has been established that in order to ensure the

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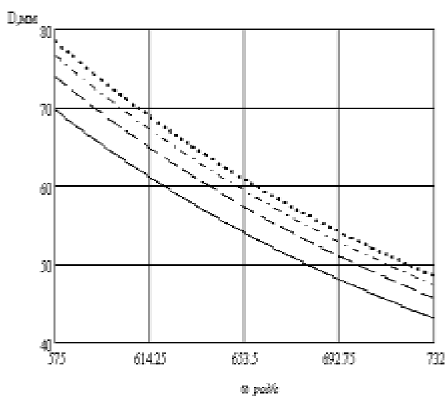
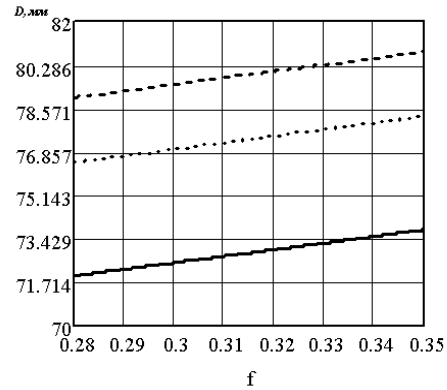
necessary sampling process, the linear velocity of the fibers after their capture must be greater than 4.27÷4.5 m / s and at this moment the number of captured fibers and, ultimately, their total mass by should exceed (3.5÷4.5) • 10^{-6} kg, and in the sampling zone should not exceed (94.5÷153.1) • 10^{-6} kg. Figure 2b. the graphical dependences of the change in the diameter of the sampling drum on the increase in the coefficient of friction of the fibers by the front surface of the drum tooth are shown. The coefficient of friction of the fibers against the surface of the tooth of the sampling drum depends mainly on the properties of the fiber, its moisture content, the contact area, the mass of the fibers, and the roughness of the surface of the front extraction of fibers from the supplied belt, that is, the process of sampling of the fibers is intensified. It can be seen from the graphs that with an increase in the friction coefficient from 0.28 to 0.35, the drum diameter increases from 71.78 mm to 73.5 mm at m = 3.3 • 10^{-6} kg, and at m = 5.2 • 10 $^{-6}$6kg drum diameter



Where, — for m=6,3•10^{-6}kg, --- at m=5,3•10^{-6}кг,-···- at m=4,3•10^{-6}kg,

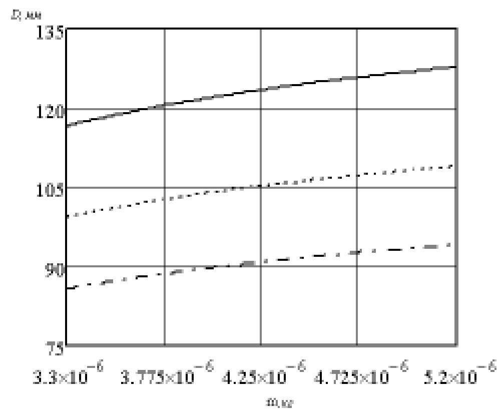
• • • • at m=3,3•10^{-6}kg

A-graphical dependences of the change in the diameter of the sampling drum on its angular velocity



Where, — at m=3,3•10^{-6}kg, --- at m=4,3•10^{-6}kg, -···- at m=5,2•10^{-6}kg

B-regularity of the increase in the value of the diameter of the sampling drum from the change in the coefficient of friction of the fibers on the front surface of the drum tooth



Where, — at ω_1=628 rad / s, • • • • at ω_2=680 rad / s, --- at ω_3=732 rad / s

B-dependences of the change in the drum diameter on the mass of fibers captured by the drum teeth

Fig. 2.Graphical dependences of the change in the diameter of the sampling drum

Increases from 78.6 mm to 80.41 mm. This is due to the fact that the greater the mass of the fibers, the greater the area of their contact with the front surface of the drum tooth and the greater the friction force. To ensure the required diameter of the sampling drum in the range of 65⁇75 mm, that is, to maintain the linear speed of movement of the fibers in the range of 9,27⁇4,5 m / s, the friction coefficient should be 0,22⁇0,3.

An increase in the mass of fibers captured by the teeth leads to a slight decrease in the diameter of the sampling drum, and the effect of the angular velocity of the drum significantly increases the diameter of the drum. So, with an increase in the mass of fibers to 5,2•10-6kg at ⁇3=628 rad / s, the diameter increases from 115 mm to 126.5 mm, and at an angular velocity of 732 rad / s, the diameter increases from 84.2 mm to 94.3 mm.

To reduce the diameter to 67 ⁇ 71 mm, it is necessary to increase the angular speed of the drum and reduce the mass of the fibers. In fig.2b Graphical dependences of the influence of the mass of fibers captured by the teeth of the drum on its diameter are shown.

By analyzing the graphs obtained, it has been established that to ensure a drum diameter of 67⁇71 mm, the angular velocity must be in the range of 650⁇750 rad / s.

CONCLUSION

From the conditions for the capture of fibers by the teeth of the sampling drum, a formula is obtained for determining its diameter, graphical overestimations of the change in the diameter of the sampling drum from the parameters of the sampling zone are obtained rational parameters of the system are substantiated.

REFERENCES

1. Bat M.I. and others. Theoretical Mechanics. Moscow: Nauka, 1968. – p. 625.
2. Yuldashev J.Q., Umarov A., Sarimsakov O. Dynamics of Interaction of a Single Fiber with a Headset of a Sampling Drum Engineering, 2020. 12, 347-355 https://www.scirp.org/journal/eng
3. Bobajonov H., Yuldashev J., Gafurov J. The arrangement of the fibers in the yarn and effect on its strength. IOP Conference Series: Materials Science and Engineering (2017)
4. Yuldashev J.K., Jumaniyazov K.J., Dzhuraev A.D., Matismailov S.L. "Calculation of the friction force of the fibers on the front face of the tooth of the sampling drum of the spinning machine" Farpi Scientific-Technical Journal 2018 Issue 2. – pp. 134-136
5. Yuldashev J.K. Dissertation on the study of the degree of candidate of technical sciences. "Increasing the quality of pneumatic mechanics with the use of multifunctional navigation headsets", 2011.