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# Calculation Scheme And Mathematical Model Of Composite Roller Shaft Vibration

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**Abstract.** The article presents the calculation scheme of the pilot device of the polymer composite coating equipment on tarpaulin seams. According to the calculation scheme, a differential equation representing the vibrations of the roller was created

**Keywords.** Polymer, roller, seam, material, sheet, coating, casing, drying, turntable, equipment, tarpaulin.

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**Аннотация.** Мақолада брезент чокларига полимер композитни қоплаш ускунасини тажрибавий қурилмасининг ҳисоб схемаси келтирилган. Ҳисоб схемасига кўра роликни тебранишларини ифодаловчи дефференциал тенгламаси ҳосил қилинган

**Калит сўзлар.** Полимер, ролик, чок, материал, лапка, қоплаш, корпус, қуритиш, айланувчи стол, ускуна, брезент.

The forces acting on the vibration of the component roller include: the force exerted by the body on the roller axis through the spring; stiffness of springs and dissipation forces; the weight of the roller axis, rubber bushing and polymer coating on the surface; stitched seam material and roller rubber bushing uniformity and dissipation forces. Fig. 1 shows the calculation scheme that determines the vibrations of the structural roller of the equipment that performs polymer coating on tarpaulin seams.

Lagrange's II-order equations [1,2] are used to create a differential equation representing roller vibrations according to the calculation scheme: $\frac{d}{dt}\left[\frac{\partial T}{\partial \dot{x}}\right] - \frac{\partial T}{\partial x} + \frac{\partial \Pi}{\partial x} + \frac{\partial \emptyset}{\partial \dot{x}} = Q(x)$ (1)

where x is the generalized coordinate, the vertical displacement of the roller; T,P – kinetic and potential energies; ∅- the dissipative function of the relay,

Q (x) is the generalized force.

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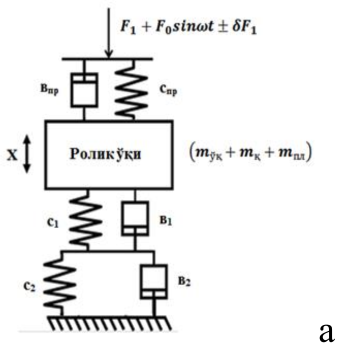


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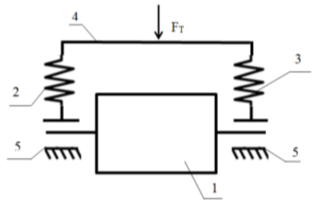

б

*here, 1 – roller, 2,3 – springs, 4 – body plate, 5 – roller supports.*

*a – calculation scheme, b – roller location scheme.*

*2.1 - picture. Calculation scheme of polymer coating equipment for tarpaulin seams and arrangement scheme of the roller in the equipment*

*Kinetic energy in the movement of the roller along the vertical X [3];*

$$T = \frac{1}{2}(m_{ўқ} + m_{қ} + m_{пл})\left(\frac{dx}{dt}\right)^2 \qquad (2)$$

where, m_oq, m_q, m_pl are the masses of the polymer on the roller axis, belt bushing and surface, respectively.

$$П = \frac{1}{2}С_{к}x^2 \qquad (3)$$

бу ерда, $С_{к}$–қайишқоқ элементларнинг келтирилган бикрлик коэффициенти.

$$С_{к} = \frac{c_1 \cdot c_2 \cdot c_{пр}}{c_1 \cdot c_2 - c_{пр}(c_1 + c_2)} \qquad (4)$$

where, s_1, s_2, s_pr are the coefficients of uniformity of compression springs, roller rubber bushing and tarpaulin material, respectively.

The dissipative function of the relay [4]:

$$Ф = \frac{1}{2}(b_{пр} - b_1 - b_2)\left(\frac{dx}{dt}\right)^2 \qquad (5)$$

where, b_pr,b_1,b_2 are compression springs, roller rubber bushing and tarpaulin material dissipation coefficients, respectively.

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Taking into account the received expressions (2), (3), (4), (5) and external forces, we determine the additions to equation (1). As a result, we create a differential equation representing the movement of the content roller axis along the vertical axis.

$$(m_{ўк} + m_{к} + m_{пл})\left(\frac{d^2x}{dt^2}\right) = F_1 + F_0 sin\omega t \pm \delta F_1 - (b_{пр} + b_1 + b_2)\left(\frac{dx}{dt}\right) - \frac{c_1 \cdot c_2 \cdot c_{пр}x}{c_1 \cdot c_2 - c_{пр}(c_1 + c_2)} \quad (6)$$

where, m_oq, m_q, m_pl are the masses of the polymer on the roller axis, belt bushing and surface, respectively, s_1,s_2,s_pr – the coefficients of uniformity of the compression springs, roller rubber bushing and tarpaulin material, respectively, b_pr,b_1,b_2 – the compression coefficients, respectively springs, roller
rubber bushing and tarpaulin material dissipation coefficients. F_1, F_0 and dF_1 are the average amplitude values and random component of the external impact force on the roller, ω is the frequency of change of the external impact force, t is time.

### List of references

1. Djurayev A., Bekhbudov Sh., Amonov.A., Rakhimov H. Justification of parameters of a compound roller with a rubber bushing of a device for strengthening the stitches of the being sewn materials// AIP Conference Proceedings Published. Online: November 15, 2021. P-070018-1- 070018-6.
2. Djurayev A., Amonov.A., Rakhimova G., Shokirova S., Atahanov A. Results of complete factory experiments of polymer composite coating equipment for treasure chokes. AIP Conference Proceedings. New York, 2023. Volume 2789. P- 040054-1-040054-7.
3. Gebel E.S. Optimizing kinematic synthesis of ploskih rychajnyx mechanisms IV class with priblijennym vystoem vykhodnogo zvena // Dis. sugar tech. science -Omsk: 2009. -223 p.
4. Veselov V.V., Gorbunov I.D., Mol'kova I.V. Ustroystvo dlya naneseniya zhidkophaznogo polymera na srezy detaley kroya// Izvestiya vuzov. Technology tekstil'noy promyshlennosti. - M.: 2007. - #3. - S. 156.