Results over of research of technical state of details as eccentric that widely apply in machines for processing of agricultural raw material are brought in paper. Technology renewal of cast-iron parts - Eccentric persons is improved with use of defense in natural gas at its burning together with oxygen.

Eccentric, wear, coefficients, spoilage, fitness, surfacing, nozzle, gas-ring.

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Results of experimental studies Conveyor TRANSPORT agricultural goods

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The basic results of experimental studies of the dynamics of motion scraper conveyor. The dependence of the performance, power consumption and energy intensity parameters of grain transportation pipeline.

The dynamics of motion, energy transport, energy.

Problem. While working scraper conveyors in organ and cell traction drive there are significant dynamic forces caused by starting or brake conveyor sudden jamming traction body, or during steady motion. Theoretical studies have established that such dynamic forces give rise to oscillatory processes with significant changes in speed and acceleration [7,6]. In this regard, the optimization of our conveyor motion mode that minimizes fluctuations in the levels of drive mechanism and a flexible traction body [9].

To confirm the adequacy obtained in previous studies of the theoretical data dynamics of scraper conveyor Experimental study on the condition of the motor on the natural mechanical characterization (real mode conveyor).

Analysis of recent research. Study of dynamic processes that occur in conveyors with chain traction body during start-up and steady movement and construction of mathematical models dedicated work [4,11,12].

The question of optimal traffic control mechanisms different purposes covered in [2,5]. The study [8] A method of solving optimization problems of motion of mechanical systems using direct variational method. Authors minimized rms dynamic component of the drive force of the mechanical system.

Solving problems using variable-frequency asynchronous electric drive to improve reliability, safety operation scraper conveyors dedicated work [1,3].

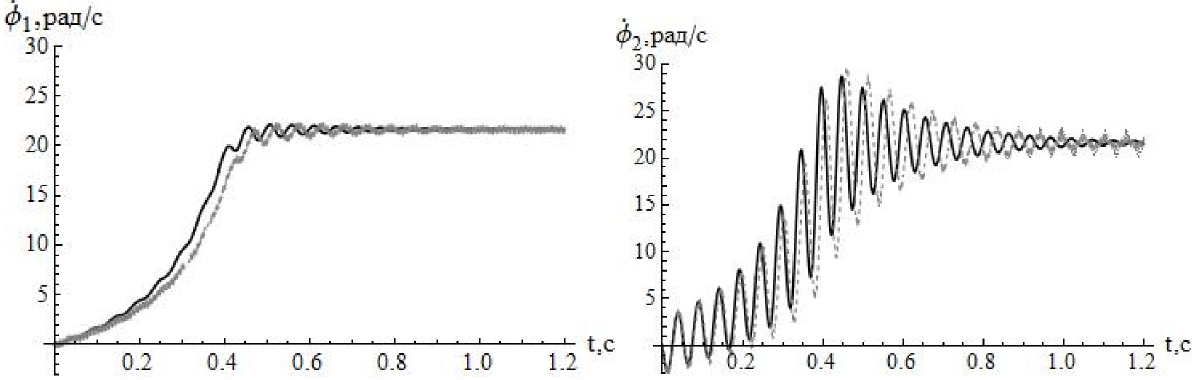
The purpose of research is to establish the influence of experimental parameters dependencies scraper conveyor (factors) on the performance, power consumption, energy grain transportation; comparison of experimental dependences of dynamic motion of the conveyor with the theoretical to determine the adequacy of theoretical studies.

Results. To compare the experimental data dynamics of scraper conveyor with theoretical Schedules angular velocity and acceleration of the drive shaft and clamp the scraper conveyor (Fig. 1). The solid black line represents the kinematic function obtained by theoretical, gray - corresponding kinematic function obtained experimentally.

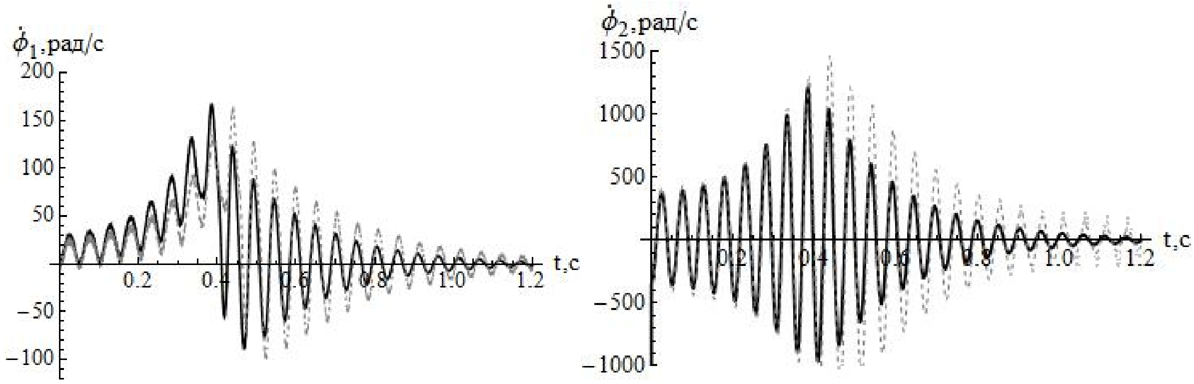
Analyzing graphic comparison of kinematic functions scraper conveyor obtained by theoretical and experimental (Fig. 1) shows that the output conveyor speed is established on identical laws, but the experimental law established time-to-speed on 0,03s more than theoretical.

The graphs of the angular velocity (Fig. 1b) and acceleration (Fig. 1, d) after reaching tensioner shaft conveyor speed established by experimental data observed some residual vibrations. This may be due to the fact that the mathematical model of the scraper conveyor into account not all of the factors affecting the dynamics of the conveyor.

Also, experimental studies have established that the nature of change of velocity and acceleration of the drive shaft and clamp (Fig. 1) has a pronounced oscillatory character, confirming the need for optimization mode start scraper conveyor to minimize these fluctuations.

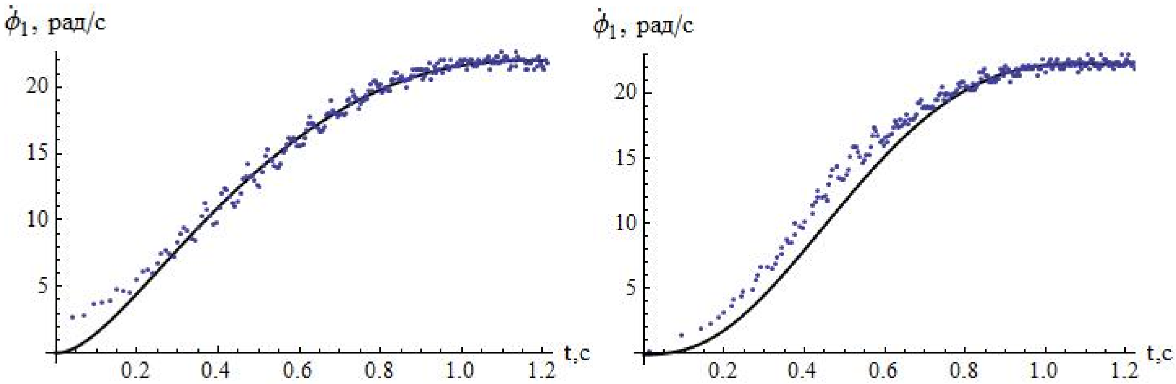


a) b)



c) d)

Fig. 1. Graphs comparison of theoretical and experimental data: a) the angular velocity $\dot{\varphi}_1$ drive shaft; b) the angular velocity $\dot{\varphi}_2$ tensioner shaft conveyor; c) the angular acceleration $\ddot{\varphi}_1$ drive shaft; b) angular acceleration $\ddot{\varphi}_2$ tensioner shaft conveyor.



a) b)

Fig. 2. Compare Charts theoretical and experimental data changes the angular velocity of the drive shaft scraper conveyor optimization criteria for RMS: a) the rate of change efforts; b) accelerating changes in the labor force branch pipeline between the load and tension asterisk.

Here are graphs comparing changes in laws angular velocity of the drive shaft scraper conveyor at the best laws obtained by theoretical and experimental. Fig. Line 2 displays black theoretically obtained optimum law of motion, and a line of gray - experimentally. Analyzing these charts can be concluded that the implementation of best mode motion scraper conveyor using frequency converter is fairly accurate. Best match theoretical and experimental data given optimization criterion rms speed of change in the labor force branch pipeline between the load and tension asterisk (Fig. 2a), the coefficient of variation is 4.97%. From the curves in Fig. 2 shows that the optimization mode start can significantly reduce the amplitude of fluctuations in levels of the conveyor.

Comparing the graphs in Fig. 1, b and Fig. 2 shows that the real movement of the conveyor enters the established rate for 0,4s, while the optimal - for 1s. The smooth process can reduce the vibration amplitude, notably for tensioning shaft. The maximum angular velocity in real is 29 rad / s, and the optimal - 21.5 rad / s. This indicates that the optimization mode start-up can reduce the oscillatory character of the conveyor 25%, and thus the dynamic loads.

The second series of experiments included setting depending on performance Q (T / h), power consumption P (KW) and energy intensity of grain transportation scraper conveyor E(KW·h / t) on the following factors: the angle of inclination to the horizontal conveyor β (Deg.), The speed of the traction body υ (M / s), the coefficient of the resistance movement of goods, taking into account the chute forms scraper ω_{on} (Cargo transported - corn). Experiments were carried out according to plan Box-Benkena [10].

Scraper conveyor type TS-40 can be either horizontal or sloping (up to 52°). However, the maximum angle of inclination significantly decreases performance, due to a decrease in fill factor mizhskrebkovoho space. Therefore, to study the range you choose the average angle of inclination to the horizontal conveyor β from 10° to 30°. The linear speed of the conveyor υ in the range of 0.7 - 1.5 m / s. For the coefficient of resistance movement of goods (corn), taking into account the chute forms scrapers and gutter material and scrapers, the following values: for contact surfaces steel steel $\omega_{on} = 0,6$; contact surface for plastic-plastic (direct scrapers) $\omega_{on} = 0,52$; contact surface for plastic-plastic (concave scrapers) $\omega_{on} = 0,44$.

Write encoding:

$$x_1 = \frac{\beta - 20}{10}; \; x_2 = \frac{\upsilon - 1}{0,3}; \; x_3 = \frac{\omega_{on} - 0,52}{0,08}. \qquad (1)$$

Here are the results of encoding factors in Table 1.

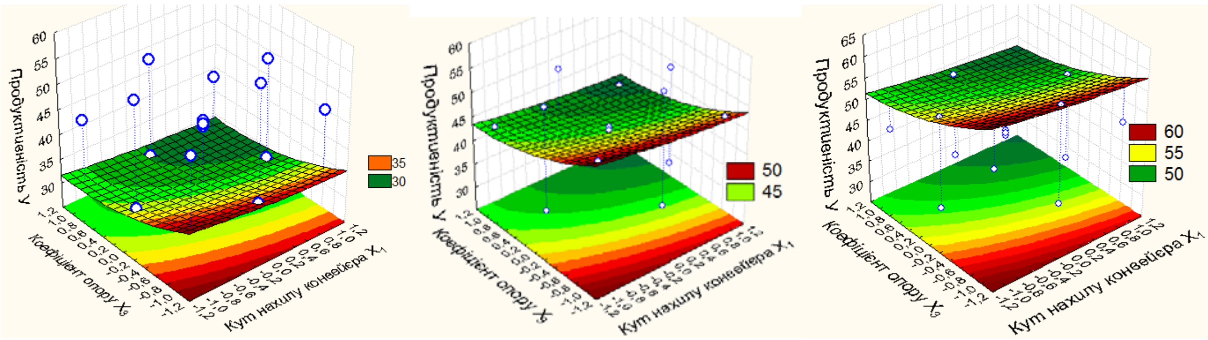
1. Results encoding factors.

Name factors	Levels and value factors			Varying intervals
	-1	0	1	
The angle of the conveyor β Hail (x_1)	10	20	30	10
Steady speed transport υ, M / s (x_2)	0.7	1	1.3	0.3
The coefficient of resistance movement of cargo along the trough (x_3)	0.44	0.52	0.6	0.08

The mathematical dependence interaction performance $Q,\ т/год$ of the coded factor variable, which is as follows:

$$y = 43,667 - 1,387x_1 + 10,587x_2 - 3,6x_3 - 0,3x_1x_3 + 0,125x_1x_3 - \\ -0,875x_2x_3 + 0,317x_1^2 - 1,883x_2^2 + 1,492x_3^2. \qquad (2)$$

The studies shown in Fig. 3 in the form of surface response variables coded factors influence performance.



a) b) c)

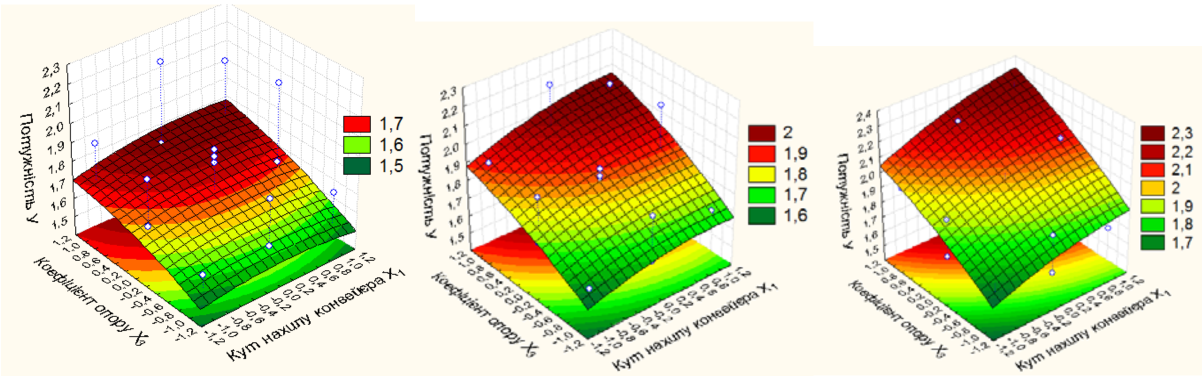
Fig. 3. Dependence scraper conveyor performance ratio of the resistance movement and angle at a speed of transportation: a) $\upsilon = 0,7\ м/с$; b) $\upsilon = 1\ м/с$; c) $\upsilon = 1,3\ м/с$.

Analysis of mutual influence coefficient of resistance and slope angle (Fig. 3) shows that the maximum productivity of 60 t / h is achieved in the transportation speed of 1.3 m / s, the angle of inclination to the horizontal conveyor 10° and with a minimum coefficient of resistance $\omega_{оп} = 0,44$ Corresponding to the contact surface of the plastic-plastic scraper and concave shape. This is because this form of scraper provides greater filling factor mizhskrebkovoho space.

Research capacity $P,\ кВт$ consumed electric scraper conveyor during transportation of grain (for example, maize) was conducted under the same variables as for productivity and received the following mathematical model of the interaction factor variable second order:

$$y = 1,863 + 0,06x_1 + 0,1687x_2 + 0,1462x_3 + 0,0425x_1x_2 + 0,0125x_1x_3 + \\ 0,045x_2x_3 - 0,0267x_1^2 - 0,0041x_2^2 - 0,024x_3^2. \qquad (3)$$

The studies shown in Fig. 4, which presents the surface response variables coded influence factors on the power consumption of the scraper conveyor.



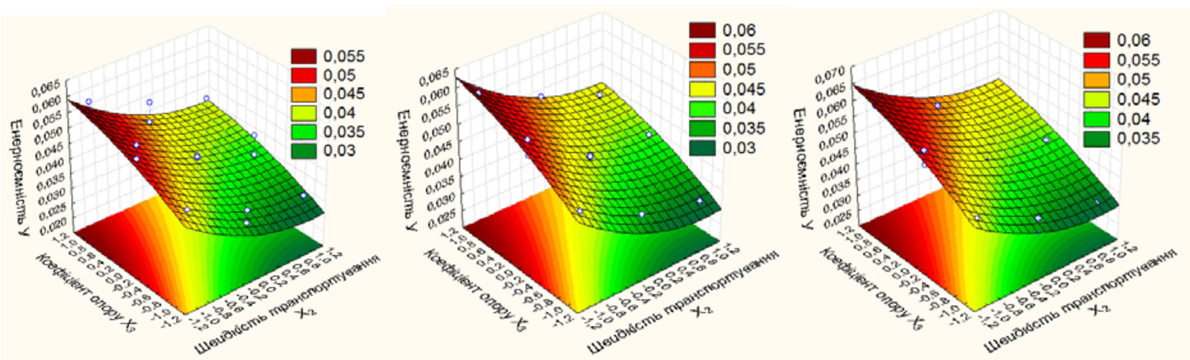
a) b) c)

Fig. 4. Dependence of the power consumption of the scraper conveyor coefficient of the resistance movement and angle at a speed of transportation: a) $\upsilon = 0,7\, м/с$; b) $\upsilon = 1\, м/с$; c) $\upsilon = 1,3\, м/с$.

Analyzing Fig. 4 found Increase speed that transport to $\upsilon = 1,3\, м/с$ pryzvozhyt to an increase in power consumption 0.35 kWh. From the angle of inclination of the conveyor to $\beta = 30°$ and the coefficient of resistance to $\omega_{on} = 0,6$, Power costs increased by 13%. Erenhovytrat significant reduction (15%) contributes to the production of high surface trough polyethylene and application forms concave scraper. This form of scraper ensures even distribution of load on the scraper across its surface and therefore reduces resistance and traction.

Analyzes the specific energy grain transportation $E,\, кВт \cdot год/т$ scraper conveyor. Fig. 5 shows the influence of the surface response variables coded factors (slope angle β, Transportation speed υ and the coefficient of resistance ω_{on}) On the specific energy consumption. Received the following mathematical model of interaction between the above second-order factor variable:

$$y = 0,0427 + 0,0027x_1 - 0,007x_2 + 0,0067x_3 + 0,00048x_1x_2 + 0,0006x_1x_3 - \\ -0,00028x_2x_3 - 0,0007x_1^2 + 0,0035x_2^2 - 0,0014x_3^2. \quad (4)$$



a) b) c)

Fig. 5. Dependence of grain transportation energy intensity scraper conveyor coefficient of resistance movement and transportation speed at an angle of inclination: a) $\beta = 10°$; b) $\beta = 20°$; c) $\beta = 30°$.

From the graphs in Fig. 4 found that the maximum power consumption is 0,065 kWh·h / t with a coefficient of resistance $\omega_{on} = 0,6$. Application forms scraper designed with high coefficient of resistance of polyethylene movement $\omega_{on} = 0,44$ can reduce the power consumption of transport by 30%. With increasing speed of transport increased productivity, and hence power consumption decreases, so its minimum value within 0,03-0,035 kW·h / t at $\upsilon = 1,3 м/с$. Change the angle of inclination to the horizontal conveyor 10° to 30° increases energy transport by 5%.

Conclusion. Experimental studies confirmed the adequacy of the chosen mathematical models and dynamic movement of the scraper conveyor. Confirmed the positive effects of the use of controlled drive with frequency converter. The influence of the angle of inclination to the horizontal conveyor β (Deg.), The speed of the traction body υ (M / s), the coefficient of the resistance movement of goods, taking into account the chute forms scraper ω_{on} (Cargo transported - corn) performance, power consumption, energy grain transportation.

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Pryvedenы Main Results of research эksperymentalnыh movement dynamics scraper conveyor. Definitely dependence proyzvodytelnosty, potreblyaemoy-power and эnerhoemkosty transport of grain from the conveyor parameters.

Dynamics of motion, transport of эnerhoemkost, эnerhozatratы.

The main results of pilot studies of movement dynamics of scraper conveyor are given. Dependence of productivity, power consumption and power consumption of transportation of grain on conveyor parameters is defined.

Movement dynamics, power consumption of transportation, energy consumption.