In Article pryvedeны method of research эксперыmentalnыh Changed vыleta bashennoho articulated crane with sharnyrno- strelovoy systemoy, as well as yzmerytelno- rehystryruyuschee equipment, kotoroe at this yspolzuetsya.

Эksperyment, Studies, crane, fluctuations, sensor usylye, motion, rotation frequency.

The paper deals with experimental studies of luffing of articulated jib tower crane and adopted necessary recording and measuring equipment.

Experiment, study, tap, vibration sensor, force, motion, speed.

AnalyteCHNE RESEARCH WORKING PROCESS KARTOPLESORTUVALOK

SV Smolinskyy, Ph.D.

In the article the sorting process analytical study of potato tubers on the surface of kartoplesortuvalok construction of a mathematical model workflow sorting.

Kartoplesorturoll, sorting, potato tubers.

Resolutionska problem. PotatoesI - one of the most important food in the diet of people around the world, but the level of mechanization in the potato is still quite high, and labor costs at harvest, post harvest and processing potatoes peredposadkoviy - significant. Important for high and stable yields of potatoes planting is sorted into fractions of planting material. In addition, the process of sorting potatoes also significantly affects the quality of storage of tubers. For mechanization of post-harvest processing of a crop of potatoes and sorted them into fractions Potato apply different design schemes and manufacturers.

The main types of sorting surfaces, which equip Potato is roller, conveyor,
hrohotna and drum. The most common working tools for sorting tubers kartopLee there is roLykov tand Maynsporterni, and Potatoesgrader to Farmerx gospodarleaf aboutladnuyut

WorkingWe bodies drum. When sorting potato fractions can be used as reshitchasto- screw your body. This sort of potato tubers by dimensional characteristics performed on slatted surface that is formed *V*-onSimilarly installed guides. All types sortuvalok work effectively in preparing the material prior to sorting, especially in providing single-layer feed for classifying surface. In addition, promising directions kartoplesortuvalok improvement is the use in their designs automatic devices that operate on the basis of various properties of tubers. But such Potato are expensive and difficult to maintain.

Since there are many different mechanical means for sorting potatoes that due to technical, technological and other precededa quality not always perform sorting process for improvement of existing structures and the development of new technical devices at the moment there is a need for scientific substantiation workflow kartoplesortuvalok.

AnaLease   Latestnih   lit.idzhen.
PROBLEMSvagina   daboutslidzhennya thatproces process of mechanization and sorting potatoes devoted to the work of scientists VP Horyachkyna, EA Deaf, NN Kolchin, VP Labour owl, AA Sorokin, N. Nastenko, NI Vereshchagin, BM Young and others. Research scientists associated with the most choice tuber characteristics that would more efficiently divide the tubers into factions, or theoretical and experimental study of sorting tubers at different working surfaces sortuvalok. Analysis of research scientists suggest that no geometric size of the tubers can be only when sorting.

The last five years of research mainly kartoplesortuvalok
epyntuvalysya to   modelyuvanni toZayetfashion
bulby   andfrom
Workingof body using bases kinematics and dynamics of a rigid body (tuber taken in the form of balls) to study parameters and operating modes investigated the working body. Oreshynym EE [1] conducted theoretical and experimental studies roller-disk sorting surface. Roan NR [2] in the study of workflow
Band Potato Mathematical model of interaction between bubbles on a surface sorting, describing the passage of bubbles through the layer heap when lowering in
sorting surface. Shkljaev KL [3] studied the workflow Potato rotary-screw type. Herewith

proanainterim supply of tubers and feeder traffic on the surface of the drum grader.

Toslidzhennyamy German scientists [4] identified the need to manage Workingm proccatfish kartoplesortuvalky to persnew mathematical models of the application process and mechatronic systems. These studies have individual character and their subsequent application requires complex analysis. In addition, the process of sorting tubers is random, so you need to consider the manufacturing process using the theory andmovirnos ti.

Metand research - Analytical research workflow Potatoessortuvalok by constructing a mathematical model. Methods of research based on the theory of probability and mathematical statistics, especially given workflow Potato.

Rezultaty research. Prand considering the sorting process bulb assume that on the surface of the body is a mixture of potato tubers Woroch with different size-mass characteristics and low content of impurities (in the study neglect the presence of impurities). Tubers, located in vorosi, dynamic action of the working body (if any) and fall of its own weight, into contact with the surface of the sorting and moving on it. When singing falling from sorting potatoes gap that separated from the heap, passes through the gap and finds himself outside the screening surface. Therefore, when driving on the tuber surface is sorting in three main forms: 1) tuber in vorosi; 2) tuber passes through Woroch and turns directly on a separation surface;
3) Tuber passes through the gaps screening surface and is made outside grader.

Prand robotand Potatoesgrader to its Workingin ontop ongiven tubers I, II and III respectively fractions of supply

$q = \dfrac{dm_I}{dt}, Q_{II} = \dfrac{dmI_I}{dt}, Q_{III} = \dfrac{dm_{III}}{dt}$. Availability daboutbag prand thisin

vyklyuchatymemo. Abouttsame, feedsand toulb Categoriesand And withstupidHb gradeof will be

$$\frac{dM_0}{dt} = \frac{dm_I}{dt} + \frac{dmI_I}{dt} + \frac{dmII_I}{dt}. \tag{1}$$

Prand passagJenny Sectionabout ontop And withstupidneither sorting vidokremlyuvatymutsya tubers fraction of the intensity and sorting

Δq_I. Then on the second level of sorting will be delivered Potato

Woroch of supply $dM_I = dm_I - \Delta q_I + dmI_I + dmII_I$. After passing the second

$$\overline{dt} \quad \overline{dt} \quad {}_1 \quad \overline{dt} \quad \overline{dt}$$

degree where vidokremlyuvatymetsya fraction II of intensity $\Delta q I_I$ On III withstupidHbpodavatymetsya toorox from oncottage

$$\frac{dM}{II} = \frac{dm_I}{dt} - \overline{q} + \frac{dmI_I}{dt} - \Delta_I + \frac{dmII_I}{dt}.$$ Most of the third degree is

yourself perebyratal $\frac{}{dt}$ withtyl, where toManualinababout fromand dopomohoth

andvtomatychnyh vidokremlyuvatymutsya uterine devices, decayed and damaged tubers. Assuming the absence of such components tcondition of effective work Potato recorded in the form of expression:

$$\frac{dm_I}{dt} - \Delta q_I + \frac{dmI_I}{dt} - q_{II} = 0. \tag{2}$$

or

$$\frac{dm_{III}}{dt} = \frac{dM_0}{dt} - \Delta q_I - \Delta q_{II}. \tag{3}$$

Masomo intensity sort of bubbles in degree - Δq_I tand the second

degree - ΔqI_I toIZnachymo based screening equation as [5]

$$\Delta q_I = \frac{dm_I}{dt} \cdot \left\lceil 1 - e^{\mu_I X I} \right\rceil, \qquad \Delta q_{II} = \frac{dmI_I}{dt} \cdot \left\lceil 1 - e^{-\mu_{II} X II} \right\rceil, \tag{4}$$

where $-$ othersthatnsyvnist sieving fractions I and II on the first and

μ_I, μ_{II} second degree

Sort respectively.

Most dVHyl dII descriptionin danddynamics gradeof use andmovirnisnymy Kolmogorov equation [6, 7, 8]. Probabilities Rosehlyadatymemoto bydependence from inzahalnenoyi Koridynaty q replacement of material on withortuvational surface (can be defined as a linear, andk and beatention coordinationnatamy). YouSee Kolmogorov equation for this process will be as follows:

$$\begin{cases} \dfrac{d}{dq} P_1(q) = -k P_1(q), & \text{1February 12th} \\[2mm] \dfrac{d}{dq} P_2(q) = k P_1(q) - k P_2(q), & \text{1February 12th} \quad \text{2March 23} \\[2mm] \dfrac{d}{dq} P_3(q) = k P_2(q), & \text{2March 23} \end{cases} \tag{5}$$

where $P_I(Q), P_2(q), P_3(q)$ - The probability of the tubers in the relevant condition. Moreover, for a certain time $P_1 + P_2 + P_3 = 1$; $Pl_2(Q), P23(q)$ - andmovirnist switchingin bulby from aboutcorre- to

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$k_{12,}\,k_{23}$-
The importance of transition probabilities of tubers from one to another

condition have a significant effect size-mass characteristics tubers (probability of bubbles in the relevant dimensional range) and their form (transition probability is high enough for round tubers is lower - for tubers ellipsoid shape and the lowest - for irregularly shaped tubers).

DTo determine the intensity of transitions from one tuber in another k_{12}, k_{23} dVHyl consider the dynamics of bubbles passing state

criz Woroch (ie, lowering the surface for sorting) and interaction with sorting tuber surface and passing through the gap in the surface. These problems have found a partial solution in the works PM Zaika, AI Zavgorodniy on sorting and other grains.

OnVNA probability of passing a certain size tubers from the interaction with other tubers, heap fractional composition and form bubbles will be:

$$P_2 = P_F \cdot P(DMIN_I < D_I < DMA_I^X) \cdot P_{12}(q),$$

$$P_3 = P_F \cdot P(DMIN_{II} < D_{II} < DMA_{II}^X) \cdot P_{23}(q),$$

(6)

where P_F – UMOVNA probability according tuber spherical shape;

$P(D_{MIN}^F < D_I < D_{I\,MAX})$, $P(DI_{MIN} < DI_I < DI_{MAX})$ – inLanguage andmovirnist

| Match | RoseAs the | bulb And | and | II |
| | fractionsth | Rosemeasures | gapa screening | |

surface.

Prand this, the distribution of bubbles form (in form factor FWho applied first academic V.P.Horyachkin [9]) and size described by a normal distribution under the law equations

$$\begin{cases} Y_F = \dfrac{1}{\sigma_F\sqrt{2\pi}} \cdot e^{-\dfrac{(\bar{F}-F)}{2\sigma_{F2}}} \\[2mm] Y_{D_I} = \dfrac{1}{\sigma_{D_I}\sqrt{2\pi}} e^{\dfrac{(\bar{D}-D_I)}{2\sigma_{D_I}{}^2}}, \\[2mm] Y_{D_{II}} = \dfrac{1}{\sigma_{DII}\sqrt{2\pi}} e^{-\dfrac{(\bar{D}_{II}-D_{II})}{2\sigma_{DII}{}^2}}, \end{cases}$$

(7)

System expressions (1) - (7) is a generalized mathematical model of the process of sorting tubers. In the analysis of this system it is possible to study the impact of various factors: the properties of tubers, operation sortuvalok, filing, etc. for quality sorting different types of machines as well as the operational control of their workflow.

Conclusion. Based on the analysis determined that Workingkartoplesortuvalok process and is consistent separation component mixtures with different fractional composition. Due to variations in properties heap, applied to the surface kartoplesortuvalok most appropriate to consider a random sorting process. As a result of research mathematical model workflow kartoplesortuvalok based on the theory of probability and mathematical statistics.

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In Article analytycheskoe of the study process conducted Sorting potatoes on the surface kartofelesortyrovky with building a Mathematical models Rabocheye sortyrovanyya process.
Kartofelesortyrovka, sortyrovanye, club potatoes.

There are described in paper the results of analytic research of potatoes sorting as mathematical model.
Potatoes sorter, sorting, potatoes tuber.

STABILITY OF DYNAMIC VIZOK-LOAD FOR OPTIMAL DYNAMICHNONOHO motion mode

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