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Pryvedenы Results of research traction properties of heavy motor-block class for concrete.

Motoblock, Traction usylye, concrete, Experimental study.

The results of investigations of traction properties of heavy-duty two-wheel tractor on concrete.

Walk-behind tractor, traction, concrete, experimental research.

UDC 631.363.21

AnalogWith CONDITIONS OF DESTRUCTION seed to the shock of contact with the blades

VA Solomka, AV Solomka, Ph.D.

In the article the seed of destruction in terms of shock interaction with rigidly mounted shovel defined energy destruction and the angle of reflection crushed particles grounded theoretically possible performance of the shredder.

Zehrbut, blade, grinding grain parameters, grinding condition, analytical dependence.

Resolutionska problem. DTo define theoretically grounded productivity shredders working on the principle of effort, it was necessary to analyze the conditions of fracture grain materials under working bodies, primarily rigid on the axis of rotation.

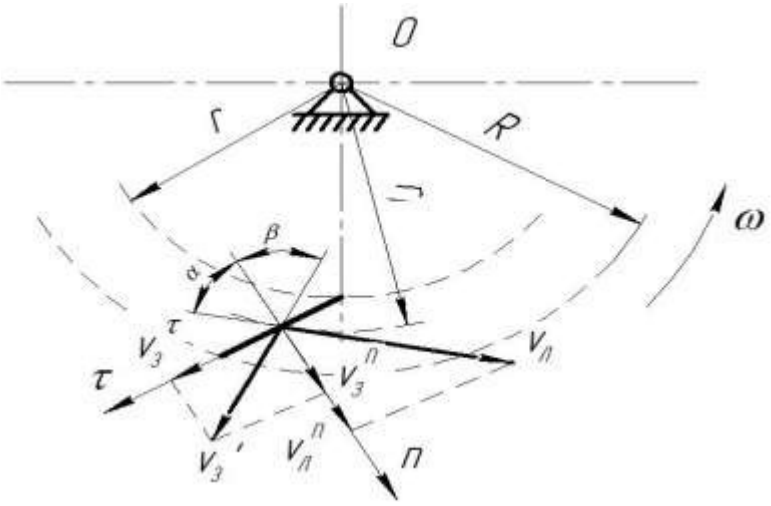
Ondribnennya grain materials at fixed particle size with the lowest possible content of dust fraction is the most important operation and energy-intensive process of concentrated feed and feed. The energy grinding grain components is from 40 to 70% of total energy consumption in the process of making animal feed [4] and depends on the method of grinding, physical and mechanical properties of materials, primarily indicators of strength and humidity. These parameters significantly affect the design parameters and operating modes shredders and depend on the type of grain material, varietal characteristics, climatic growing conditions, humidity and other factors.

AnaLease Latestnih dossurvey findings. Ondribnennya grainnew materials for further use for making animal feed or concentrated feed is carried out mainly percussion machines, which are characterized by a high degree of grinding and relatively low energy, which is several times smaller than the machines that work on different principles (crushers, cone , Waltz, Burr grinders, etc.). Analysis of previous studies [1, 2, 3] showed that the efforts of grain destruction blow much smaller than compression, and with application of force along the fracture resistance grains smaller than the transverse action. Important role played by grain size, increasing the size of grains within grade increases its resistance to fracture. Increased grain moisture resistance reduces crushing in compression, increasing residual (plastic) deformation. In corn, on the contrary, increasing the humidity to 25% grain fracture resistance increases and with further increase of humidity - falling [2].

A significant contribution to the development of the theory grinding made VP Horyachkin, VI Serum, SV Melnikov, GM Kukta, II Re- Vanco, OM Pylypenko and several other scientists. But the impact fizyko and mechanical properties of materials on the grain size of the particles after crushing blow and the specific energy process requiring further research.

Metand dperssurvey findings. Pidvyschyty Effectsness processin ondribnennya grain material blow by analyzing the conditions of their destruction under the influence of operating the shredder.

Rezultaty research. Prand seeds can blow shovel affect the whole of it, or chopped into shares (brittle fracture), and in the case of plastic blow - slide on its surface by centrifugal force to climb. Consider the case where the seed upon impact blade is dissolved into shares and remain whole and on its surface cracks formed (Fig. 1).



Ric. 1. Interactionaction grainsand fromlopatkoth to ondribnyuvalniy Countrymeasure.

Prand meeting with seeds scoop act on it with a shock pulse *S*[5]:

$$S = \int_0^t F_D dt = m_{from} \cdot (V_{from} - Vs), \quad (1)$$

where F_D- The impact force on the blade seed, N; m_{from}- Mass of grain, kg; *Vs and Vs* - Seed rate before and after impact, m / s.

Solderstyvshy the surface is perfectly smooth blade and hard set at an angle *α*the direction of travel, and the angle of reflection seed *β* > *α*,define module speed and direction of flight seed after hitting on her shoulder blades [5]:

$$V_{from} = v \cdot \sin\alpha \cdot \sqrt{1 + \varepsilon^2 \cdot ctg^2\alpha}; \quad \beta = arcctg(\varepsilon \cdot ctg\alpha), \quad (2)$$

where V_{from}- Seed after hitting speed, m / s; *vl* - Speed of rotation of the blade, m / s; *α*- The angle between the normal to the direction of rotation of the blades and, deg .; *β*- Angle reflection from the surface of grain shovels, deg .; ε - the coefficient of restitution seed after impact, which is determined from the directory or experimentally by relationship:

$$\varepsilon = \sqrt{h_{to}/h};$$

where h_{to}- The height of the reflection from the surface of grains, m; $h_{Section}$- Seed drop height, m.

ConsideringThat seed is not perfectly elastic body (ε < 1), the value of the module of its speed after reflection shovel is smaller than the speed of rotation of the blade, ie $V_{from} < Vl$. Fromand preliminary estimates, the rate of seed after reflection shovel is 30 m / s. The angle of reflection seed *β*tovice versa, will exceed the angle of fall *α*[5]. In our case, *β* ≈ 400.

DTo simplify the research process believe that the initial velocity at impact grains in the direction of the blade is missing ($v_{from_u} = 0$)And the rate of blades $v_l = \omega \cdot r_i$Where ($r \le r_i \le R$). Then the expression (1) in the case of reflection seed shovel written as:

$$\int_0^t F_D\, dt = m_{from}\cdot\omega \cdot r_i \cdot \sin\alpha \cdot \sqrt{1+\varepsilon^2 \cdot ctg^2\alpha}\,. \qquad (3)$$

MeJi integrating the left side of (3) determine the conditions of speed *with*passagtion of sound waves in an elastic medium, which can be formalized seeds:

$$c = \sqrt{\frac{\lambda + 2G}{\rho}}, \qquad (4)$$

where - Lamé parameters, $\lambda = K - \frac{2}{3}G$; K- Bulk modulus of elasticity strain: $K = \frac{1}{3}\cdot\frac{(1+\mu)\cdot}{(1-2\mu)}$; G - modol MDPzhnostiArmed Forcesments strain: $G = \frac{E}{\cdot(1+\mu)}$; μ- Coefficient of transverse deformation for grainon (in the sense of Poisson's ratio).

Pidstavyvshy values obtained in expression (3), whereas the time *t*aboutorigin in waves of grain - a ratio of length (diameter grains d_{pr}) To the wave velocity *c*, We obtain:

$$t = \frac{d_{pr}}{c} \cdot \frac{(5a+6b)/30}{\sqrt{\frac{E\cdot(1-\mu)}{(1+\mu)\cdot(1-2\mu)\cdot\rho}}}, \qquad (5)$$

where - seed density; *a, B* - The width and thickness of the seed.

Ploschu ontop grainnyny tand its aboutCapacity it is possible toIZnachyty by expressions [2]:

$$S_{from} = 4\pi R\cdot(l+3R); \qquad V_{from} = K\ with\ abl\ , \qquad (6)$$

where S_{from}- Seed surface area, m2; V_{from}- The amount of seed, m3; *a, B, l* - Appropriate thickness, width and length of the grain, m; *R = (5a + 6b) / 60*
- Reduced seed radius, m; *K*- Coefficient taking into account the form of seed.

Diametr seed determined from the dependence: $d_{pr} = (5a + 6b) / 30.$
Thendi, taking into account (5), the expression (3) can be rewritten as:

$$\frac{F_D\cdot(5a+6b)/30}{\sqrt{\quad}} = m\cdot\omega\cdot r\cdot\sin\alpha\cdot\sqrt{1+\varepsilon^2\cdot ctg\,\alpha}$$

$$E \cdot (1 - \mu) \quad \textit{from} \quad (1 + \mu) \cdot (1 - 2\mu) \cdot \rho \quad \textit{and} \tag{7}$$

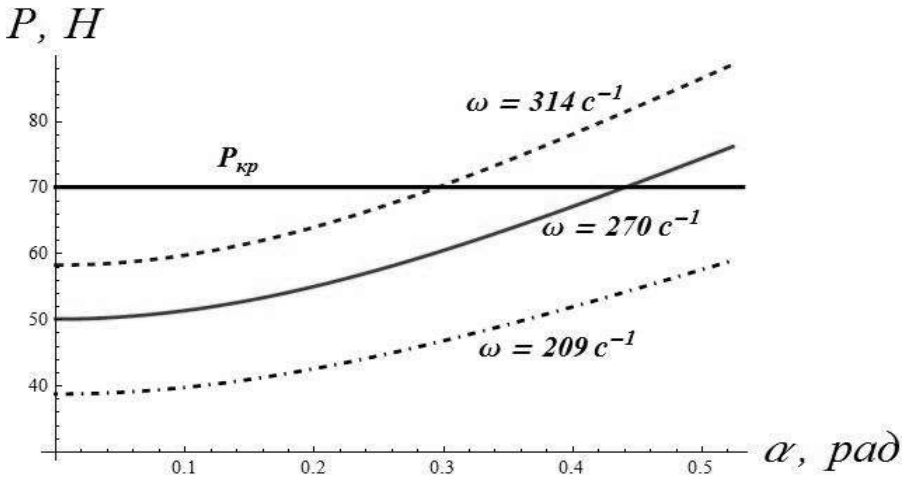
The condition will seed crushing ratio, where $Fr_{uyn.}$- The $F_D \geq F_{have\ been\ destroyed.}$, impact force during fracture grain compression.

From the expression (7) define the force of impact to the blade during seed have been destroyedbath to share it:

$$F_D = \frac{m_{from} \cdot \omega \cdot \ \cdot \sin}{(5a + 6b)/30} \sqrt{\frac{E \cdot (1 + \varepsilon^2 \cdot ctg\,\alpha) \cdot (\ \ - \mu)}{(1 + \mu) \cdot (1 - 2\mu) \cdot \rho}} \qquad (8)$$

Andstitutionalism expression (8) shows that with increasing angle *α*tilt the blade to the direction of rotation of the impact force on the blade seed increases (Fig. 2). On the other hand, when the angle of inclination of the blade and the angular velocity of rotation increases the content of dust fraction in powdered material and specific energy process that adversely affects the quality performance of the shredder.

The above statements are true for conditions that affect seed of blade is crushed.



Ric. 2. Dependence of impact force on the blade seeds of its tilt angle at different angular velocities.

Wvydkist blades to blow seeds *V*ontartaric be such that the impact force *F*zmochap overcome the elastic deformation and plastic deformation strengthening reach the surface of grain, so it should collapse into shares at impact spatula. In this case, we can assume that the share of the blade also reflected similar whole grains and their fair expression (8), or they are moving plastic body with a shovel, moving under the action of centrifugal force, taking into account the friction force on the surface to climb up and left flight towards the deck (sieves). Probability second case above, so consider it in more detail. Assume that the seeds when struck by the blade shredder destroys it in *n*ChaStock, zatratyvshy this process

thnerhiyu *Wr*. Given the impact, particles acquire seed speed $V_{i_{from}}$, asand dth directionWleń tofromDovže Sectionravines lopatkand

(Mr.lastychnyy shot) or reflected from it at an angle *β,*andnalohichno whole grains (elastic-plastic blow).

DA case of reflection crushed seed particles expression (8) takes the form:

$$F_{n}^{D}=\sum_{i=1}^{h} m_{from}\cdot\frac{\omega\cdot r\cdot\sin\alpha}{(5a+6)/30}\cdot\sqrt{\frac{E\cdot(1+\varepsilon^{2}\cdot ctg\,\alpha)\cdot(\quad-\mu)}{an\quad d}}\quad forp, \qquad (9)$$

$$\geq F\cdot(1+\mu)\cdot(1-2\mu)\cdot\rho$$

where $\sum_{i=1} mch_{from} \approx CN$ - The total weight of crushed particles of grain kg.

On the other hand, the theorem of change of kinetic energy on impact bodies [3]:

$$W_{for}=A_{p}+\frac{1}{2}\cdot\left|\sum m_{h_{from}}\cdot V_{i_{from}}-m_{from}\cdot Vs^{2}\right|, \qquad (10)$$

where W_{for}- The kinetic energy of the disk blades to strike; And_{p}- Energy (Work) Destruction of seed; $m_{h_{from}}$ - Weight *and*-her share chopped

seed, $\sum_{i=1}^{m} mch_{fro} \approx$;m_{from}- Seed weight; *Vs* - The rate of seed to shock, Taking *Vs =0*.

RoseLet us consider the second case where grains or her share after blownot reflected in and move along the surface of the blade under centrifugal force $F = \omega^2 \cdot r \cdot \sum_{i=1}^{n} m_{with\ i}$, Coriolis force $F_k = 2\omega \dot{r} \sum_{i=1}^{n} m_{with\ i}$ tand power frictio $F_T = f\omega \cdot \sum_{i=1}^{n} mi_{from} \cdot \left(2\dot{r}_i - \omega r_i \cdot \sin\alpha\right)$. Moving parts along the blade n buwhere carried out provided $\omega r_i > f \cdot \left(2\dot{r}_i - \omega r_i \cdot \sin\alpha\right)$. Shares seed that:

WILLing to go with the blade at a time $r_i = R$. when

DTo determine the relative velocity of the particles in seed pan (Fig. 1) design the forces acting on the axle *r*and construct the differential equation of motion:

$$\sum_{i=1}^{n} m_{of} \cdot a_\tau = \sum m_{i_f} \left[\omega^2 \cdot r \cdot \cos\alpha - f\omega \cdot \left(2\dot{r} - \omega \dot{r} \cdot \sin\alpha_i\right) \right] , \qquad (11)$$

where *and*$_r$- Acceleration of particles moving grains in a pan.

AboutvivshymoDPOVienna Peretusion, aboutkeep toirafrom to determine the relative acceleration of particles moving in a pan:

$$_\tau = \omega \cdot \left[\omega \cdot r_i \cdot \cos\alpha - f \cdot (2\dot{r}_i - \omega r_i \cdot \sin\alpha) \right] . \qquad (12)$$

Wvydkist climbing particles is determined from the expression:

$$V_{and_{from}} = \sqrt{(\omega R - v_r \sin\alpha)^2 + (v_r \cos\alpha)} , \qquad (13)$$

where · - modrelatively speed replacement Chaseed stock $v_r = r_i$ Sectionabout
pan.

Pishennya equation (13) will find the value relative velocity of the grains, or particles in a pan, but it
quite cumbersome, in addition, the relative velocity of the particles in a pan of grain compared with the speed of rotation of the scapula fromnachno IUnsha, volumein to practicalthem rozrahunkiv notth it is possible fromneglect [3]. We accept that at the time of convergence of the scapula share
grainnyny maquarterdeckb $V_{i_{from}} = \omega R$ and directionWleń speed tofromDovže floorneither
blade to the side deck. The radial component of the initial velocity of particles flying, taking into account the loss of speed due to friction on the blade will be:

$$V_{from}^{i} = f_d \cdot \omega \cdot R \cdot \sin\alpha , \qquad (14)$$

where f_d - coefficientitsiyent, uabout toracounted toexpensesin wvydkosti grainnyny,
$f_d = f \cdot \left(2r_i - \omega r_i \cdot \sin\alpha\right)$.

Thend, the expression (10) taking into account (12) is written as:

$$A = \frac{\omega^2 \cdot R}{2} \cdot m \cdot \left[1 + \left(\frac{1}{4} \sum_{i=1}^{n} h_f \right)_{Section_p} - m \right] . \qquad (15)$$

On the other hand, the cost of energy (work) for grinding grain materials SV Melnikov proposes to determine the expression [6]:

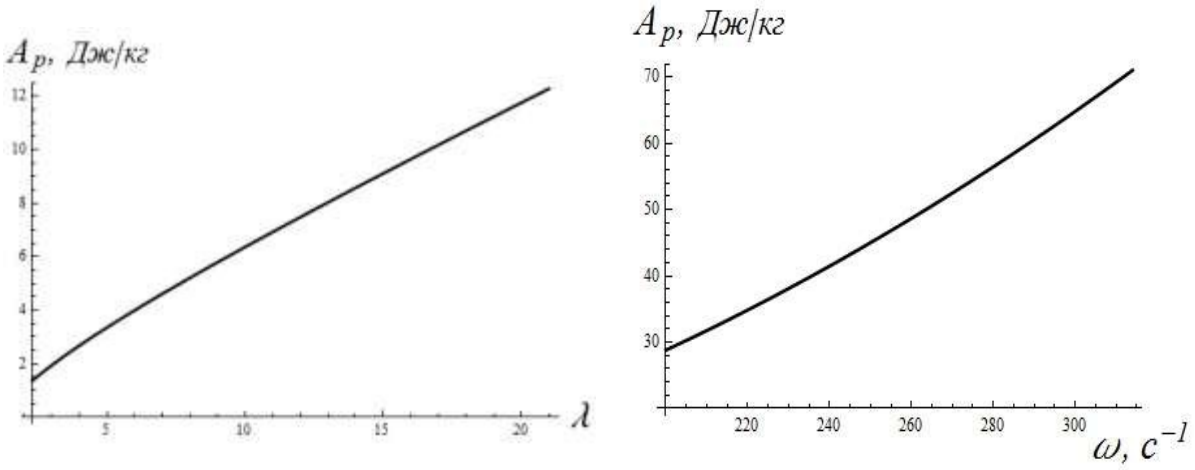
$$A_p = C \cdot \lg\lambda^3 + C_2 \cdot \left(\lambda - 1\right) , \qquad (16)$$

where *C1* and*C2* - Factors that take into account the physical and mechanical properties
grainnew materials; λ - The degree of grinding grain $\overline{S_0}$
λ S_{for}Or
$\lambda = \frac{D_{from}}{}$;$S_{for}andS_{Section}$- Under specific area of the particles of the final product
d_{and}
millingin whole grains and area to crushing; *Dz* andd_{and}- Reduced diameter and the diameter of the crushed seed particles.

Odds *C1* and*C2* determined from experimental data. Thus, to take barley *C1* = (1.0 ... 1.3) 104 J / kg, *C2* =(0.6... 0.9) 104 J / kg. Depending on the degree of grinding module
ondribnennya barley within 2,3 $\leqslant$ $\leqslant$21,0 [6].

According to expression (16) we construct a graph of the specific destruction of barley seed of particle size (Fig. 3, a), and the expression (15) - on the speed of the disk (Fig. 3, B).

Andstitutionalism graphs shows that the impact energy blades for seed exceeds the energy required to fracture during seed of dynamic load to determine theoretically possible performance of the shredder.



and) b)

Ric. 3. Dependence of specific seed of destruction on the degree of grinding and) and the frequency of rotation of the disk shredder (*to*).

Conclusion. As a result of analytical studies found that the choice of rational parameters and modes of operation of crusher grain materials with rigidly fixed working tools (shovels) Impact can be determined theoretically possible performance of the shredder.

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In Article rassmotrenы terms razrushenyya grain during the shock interaction with zhestko zakreplennoy lopatkoy, opredelena Energy razrushenyya and ugol reflection yzmelchennыh particles, something allowed the obosnovat Theoretically vozmozhnuyu proyzvodytelnost work grinder.

Zehrbut, shovel, yzmelchenye grain, Options, terms yzmelchenyya, analytycheskye addiction.

In paper the terms destruction of grain are considered at shock co-operating with hardly envisaged shoulder-blade, energy of destruction and corner of reflection of ground up particles are certain, that allowed to ground possible productivity of work of grinding down in theory.

Grain shovel, grain refinement parameters milling conditions, analytical dependence.

UDC 631: 372

ENERHOZASOBY INTEGRAL layout: REALITIES AND AREAS OF IMPROVEMENT

D.In. Shkarivskyy, Ph.D.

Statementbut an analysis of integrated structural and Layouts power means agricultural land.

Mobilnyy power tool layout, integrated layout, design and development.

Resolutionsca problems. Mobile power tool (MEW) is the basis for the creation of machine-tractor units (AIT). The effectiveness of its use in the unit and volume manufacturing operations that can be performed with its use determine the composition tractor fleet management, and hence the cost of the final product. Recently traktorobudivni company significantly expanded its range of products including the production of non-traditional vehicles for a design-layout circuits (layouts), including integrated. It made changes in pricing policies of companies and not always had a positive impact on the cost of the final product of agriculture.

In such circumstances are relevant question that addresses the areas of structural and Layouts MEW and comply with the provisions of the state target program
Reactivementation technology policy in agriculture.