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In pryvedennoy articles presented usovershenstvovannыy vыsevnoy pneumatic mechanical apparatus with vыsevnыm join the new drive kotorыy ymeet napravlennыy vector prysasыvayuschey force. Dannaya constructions vыsevnoho drive and improves accuracy of povыshaet nadezhnost of technological process vыseva. Vыsevnoy pneumatic mechanical apparatus with predlozhennoy constructions vыsevnoho drive nuzhdaetsya in smaller degrees razrezhenyya in pnevmatycheskoy system as a whole something umenshyt эnerhozatratы tractor unit for poseva tehnycheskyh cultures.

Pnevmomehanycheskyy vыsevnoy apparatus, vыsevayuschyy drive prysasыvayuschaya force napravlennыy vector.

In paper over improved pneumatic mechanical sowing apparatus is presented with new sowing disk which has directed vector of suction force. This construction of sowing disk improves exactness and promotes reliability of technological process of sowing. Pneumatic mechanical sowing apparatus with offered construction of sowing disk needs in less degree rarefaction in pneumatic system, that on whole will decrease power expenses of machine and tractor unit asm for sowing of industrial crops.

Pneumatic mechanical sowing apparatus, which sows disk, suction force, directed vector.

UDC
631.26.3

The technique of structural and technological calculations hammer crusher line granulation of wood biomass

VM Polishchuk, S. Tarasenko, Ph.D.

Existing methods of structural and technological calculation hammer crusher and conducted their improvement regarding grinding of biomass for biofuel production lines granulated

Motroughs crusher, the density, the critical linear velocity of the rotor, rotor diameter, the length of the rotor.

Resolutionska problem. Dll best use of biofuels most in need of previous preparation. The main problems are the high humidity and low bulk density of most vegetable waste, leading to the need for their drying and sealing for easy transport. The most effective way to prepare biofuels is their granulation, as this final moisture content of the finished product is only 8.12%, and the starting material is compacted 5-10 times, which increases their calorific value and reduces transport costs.

One of the stages of production of biofuels is grinding granular materials, which can be performed in shredder, cone, buccal, hammer crusher and so on. For final
crushing material in granular biofuels production lines are often used hammer mills that relate to crushing machines percussion. For efficient operation of these machines is extremely important to design and calculate their design parameters.

AnaLease FinalnnihWorkingth IUTodafor dperssurvey findings.

desigReference hammer crushers engaged V. Borshchiv, VA Baumann, N. Halperin, AN Planovskyy more.

In [5] presented an efficient method of calculating the hammer crusher, which, in our opinion, still has some drawbacks that are as follows: to determine the critical linear
wvydkosti rotor in which the possible destruction of the material given value, it is necessary to know the resistance of particle degradation, the value of which biomass is not in the references (in other techniques used for this purpose the boundary of the material in tension); Performance is calculated by the formula

$P = D_p L_p n^2$ Categoriesanddzvychayno high, that is not true (this Fauremule bred respect crushing limestone [1]). In [2] defined Realto Productsness drobarky, aboutdnak ontuzhnist engine formula $N = 9 D_p L_p n^2$ Ivno overpriced. In [10] In thestanovlena racionalna sweatzhnist IRyhuon, aboutdnak missing construktyvnyy calculation elements crusher.

Volumein**for research** improvement is presented in the literature constructive-technological methods of calculation hammer crusher.

Rezultaty research. In crusher Impact material ruynuyetbe under the influence of mechanical shock, in which the kinetic energy of moving bodies all or part of their energy goes into deformation and fracture. As a result of being struck with a hammer or bylom particle material is destroyed, its fragments flying and recline on the grid-iron lattice, creating crushing chamber. Udaryayuchys about grid-play, additional material is crushed and reflected again fall under the rotor. This is repeated many times until the particle material reached a certain size, will not go through the grate to play the discharge.

In some cases, the material, getting hit, starts to rotate around its center of gravity at a speed close to the speed of the working body mills and destroyed, as this action of centrifugal force in a piece of material there is a voltage which exceeds the limit tensile strength (eg wood across the grain). The critical size of a piece of material in which begins its destruction, is determined by the experimental formula [1]:

$$d_{2cr} = 230 \cdot 10^{-5} \cdot \frac{\sigma_p}{\rho \cdot v_p^{1,5}}, \quad (1)$$

where $d_{2\,cr}$ – criticaltion diameter material supplied to the grinding, m; *Vp* – wvydkist effort equal to the linear speed of the rotor, m / s;

σ_p – Ultimate tensile strength of the material in tension, Pa;

□□□□ schilnist materialalt is crushed, kg / m3.

If a piece of material will have a size smaller than critical, then these conditions it yields grinding.

DA hammer crusher main criterion for the calculations is critical linear velocity of the hammer, where the possible destruction of the material given value. Rotor speed is selected depending on the maximum size of a given product and grinding material characteristics - limits of the material in tension and density [1]:

$$VR_p = 0{,}0175 \cdot \sqrt[3]{\left(\frac{\sigma_p}{\rho \cdot d_2}\right)^2}, \quad (2)$$

where *vkr* – criticalon the linear velocity of the rotor in which the possible destruction of the material given value, m / s; d_2 – diameter material supplied to the grinding, m.

Zilnist major forest wood trees and garden Ukraine is 460-830 kg / m3.

Derewine has toandjuice Ecness prand tensionbath uzdoVJ fibers; the average value of different wood species can be Acceptedand 122 MPa. However, to use the property for the full practice hard because of the complexity fixing parts ends with a developing skolyuyucha voltage and is jam timber. As bad wood resists these types of forces, destroying almost certainly is not in the form of the gap, and in the field of fastening parts as chipping or crushing. As a result, relatively rare wood used for stretching along the fiber. Tensile strength across the grain on average for all species is approximately 1/20 tensile strength along fibers. On the one hand, this low strength (3-12 MPa), on the other □□ mozhly of fracture when resistance may fall to zero, forces refrain from the use of wood for stretching across the grain. Tensile strength across the grain is essential in cutting and chipping wood [6]. Knowing the minimum required for the destruction of the material linear speed off, you can make for the destruction of material particle angular velocity of the hammer as [2]:

$$\omega = \frac{v}{R_{max}}, \quad (3)$$

where □□□□ ne velocity of the hammer rad / s; *Rmax* – radius most distant point from the axis of the rotor off the city.

Radius most distant point from the axis of the rotor hammer Rma_xdetermined in accordance with design size hammer. You must ask a hammer such structural dimensions as length *and*Width *b*and thickness □.

Thendi distance from the center of mass to the axis of the hole hammer (assuming one hole on molottsi) is defined as [2]:

$$c = \frac{a^2 + b}{6 \cdot a}, \quad (4)$$

where *with*– radius from the center of mass of the hammer to the axis of the hole, m; *and*– tovzhyna hammer, m; *b*– shyryoff to the city.

Whatwould crusher shaft bearing is not transmitted shock pulses of hammers, hammer square radius of inertia r_{with}relative to its point of suspension to the drive should be defined as [2]:

$$r_c^2 = \frac{a^2 + b^2}{12}, \quad (5)$$

where r_{with}– radius hammer inertia compared to the center of mass, m.

Radius hammer inertia about the axis of its suspension is [2]:

$$r = \sqrt{r_c^2 + c^2}, \quad (6)$$

where r– radius hammer inertia about the axis of its suspension, m.

Distanceing from the end of the hammer to the axis of its suspension is [2]:

$$l = c + 05 \cdot a, \quad (7)$$

where l– distance from the end of the hammer to the axis of its suspension, m.

Pislya of selected distance from the axis hanging off to the axis of the rotor. The choice is made based on the condition that a steady job hammer crushers, provided there is inequality of distances from the axis hanging off as his foreign working edge and the axis of the rotor. The distance from the axis hanging off to the rotor axis *R0* ontartaric be greater than the distance from the axis of his suspension by the end of the hammer *l*(*R0*>*l*) [2].

Knowing the distance from the axis hanging off to the rotor axis *R0* tand the distance from the end of the hammer to the axis of its suspension *l*,

the radius of the most remote from the axis of the rotor off point, which is necessary to calculate the angular velocity of the hammer by the formula (3) [2]

$$R_{\max} = R_0 + l, \quad (8)$$

where *Rmax* – radius most distant point from the axis of the rotor hammer, m; *R0* – distance from the axis hanging off to the rotor axis, m; *l*– distance from the end of the hammer to the axis of its suspension, m.

Knowing cornerin wvydkist moTraysand mozhna youmean the centrifugal force of its inertia [2]:

$$P_m = m_m \cdot \omega^2 \cdot R_c, \quad (9)$$

where P_m– the centrifugal force of inertia hammer, N; m_m– off weight, kg; *Rc* – radius circle placing the center of mass of hammers, m.

Motrays drobarofor toyhotovlyayutsya from withandLee. Masa tacosth

off is given by [2]:

$$m_m = VM \cdot \rho_m = a \cdot b \cdot \delta \cdot \rho_m, \quad (10)$$

where V_m– aboutCapacity hammer m3; ρ_m– uilnist material from which made hammer, kg / m3 ..

Radiocircle with the center of mass accommodation hammers given by [2]:

$$R_c = R_0 + c, \quad (11)$$

Diametr hanging off axis defined as [1, 3]:

$$d = 1.36 \cdot \sqrt[3]{\quad /}$$

$P_m \cdot \delta$ σ_m, (12)

where *d*– axis diameter hanging off the city; □□□□ to

σ_m– dopustimulated tension bending, Pa.

Dopustimulated tension bending is taken from reference books. The thickness of the disc is given by [1; 2]:

$$\delta_d \geq \frac{P_m}{d \cdot \sigma_{toMr\ amended}}, \quad (13)$$

de □ thicknessand drive m; $\square_{toMr\ amended}$ – Supposeand tension on crushing, Pa.

Dopustimulated Categoriesapruzheness Categoriesand frommynannya pryymayetXia from reference books. The outer radius of the disk is defined as [2]:

$$R = R_0 + 05 \cdot d + hmi_{Categories}, \quad (14)$$

where *R*– Callnishniy disk radius, m.

Minimalnyy RoseWeights refetlock between fromvoramy Sectionid aboutB Sectionidvishuvannya and the outer edge of the disc should be [2]:

$$h_{ECategories} \geq \frac{05 \cdot P_m}{\delta \cdot \sigma_{sp}}, \quad (15)$$

where $hmi_{Categories}$– minimum size of crosspieces between holes axle suspension and outer edge drive m; $\square_{tomp}$– allowable shear stress, N.

Dopustimulated shear strength is calculated by the formula [2]:

$$\sigma_{ton\ sp} = (02 \ldots 0.3) \cdot \sigma_t, \quad (16)$$

where □ liquid limit, Pa.

Dla withandLee mapkand CT5, andfrom even asth Categoriesaychastishe toabouthotovlyayutsya lolotky crushers, liquid limit values □ is 260-290 MPa.

Diametr rotorand crusherandtoyznachayetXia Ifor ondvoyena suma distance from the end of the hammer to the axis of its suspension *l*and the distance from the axis hanging off to the rotor axis *R0* [2]:

$$D_p = 2(R_0 + l), \quad (17)$$

where *DP* – crusher rotor diameter, m.

Tovzhyna rotorand drobarkandtoyznachayetXia bylying down from yogiabout diameter [2]:

$$L_p = (0.8 \ldots 12) D_p, \quad (18)$$

where L_p– tovzhyna rotor crusher, m.

Number moTrayss bylying from fizyko-mechanical properties of the material. Many layers will slow down the passage of material through the work zone and end forintsem, be marked on performance. It may also be affected asist crushing effect perepodribnennya □□ mozhly

little hammers same number of particles observed breakthrough material and, as a result, due to the low action on the material, it does not reach the required degree of fragmentation. Of course the required number

hammers and their ranks established empirically. Minimum number should be at least 2 to balance the rotor shaft.

Productsness crusher is determined by the formulas [1]:

$$P = 480 \cdot \frac{D_p^{1,5} \cdot L_p \cdot K_\beta}{v_p^{0.3} \cdot z^{05}}, \quad (19)$$

where P – productivityness crusher, m3 / h; Vp – linear rotor speed, m / s; z – orArctic Ocean series hammers; K_β – coefficientsiyent, depending on the position of blasting plate.

Prand paper mills lowered pick stove K_β = 1.3, and when fully erect pick stove K_β = 5.2 [1]. Rotational speed of the rotor nEIDnachayetsya according to the known angular velocity of the hammer [2]:

$$n = \frac{30 \cdot \omega}{\pi}, \quad (20)$$

where n – Chastota rotor / min.

Potzhnist Engine Crusher is given by [4]:

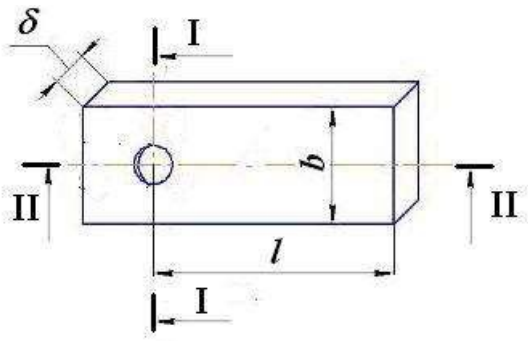
$$N = \frac{(0.1 \ldots 0.15) \cdot P \cdot i \cdot \rho}{1000}, \quad (21)$$

where N – sweatzhnist engine crusher, KW; P – productivityness crusher, t / h; *and* – degree of grinding material; □□□□ SC crushed, kg / m3.

The degree of grinding *i*characterized by the ratio of the size *Dm* wuterine material to grinding to size d_mwThe uterus after grinding [5]:

$$i = \frac{D_m}{d_m}, \quad (22)$$

where *Dm* – RoseWeights pieces of material to grinding, m;
d_m – RoseWeights pieces of material after grinding, m.



Ric. 1. Scheme for the calculation of stresses.

Diametr shaft in a dangerous intersection near the pulley is given by:

$$d_0 = 0.052 \cdot \sqrt{\frac{N}{\omega}}, \quad (23)$$

where d_0 – diameter shaft in a dangerous intersection near the pulley, m; N – sweatzhnist engine crusher, KW; speed rotor, rad / s.

The following is the calculation hammer strength.

The tension that occurs at the intersection of I-and off is:

$$\sigma_{I-I} = \frac{P_m}{(b - d) \cdot \delta}, \quad (24)$$

Dopustimulated tension at the intersection of I-and off prand this is given by:

$$\sigma = \frac{\sigma^t}{s}, \quad (25)$$

where $\sigma_{And\ extra\text{-}I}$ – allowable stress at the intersection of I-and off, Pa; σ_t – liquid limit, Pa; s – WANAs strength.

Stock Etsnosti to moTrayss drobarofor withTanovyt 5. Tension shiftstion, uabout toynykathere is to Peretuneither AndI-II hammer is:

$$\sigma_{ISGI\ w-I} = \frac{P_m}{2 \cdot \delta \cdot (l - b - d)}. \quad (26)$$

Dopustimulated tension steel shift is 82 MPa. Tension to will changetion, uabout toynykathere is to molottsi, is given by:

$$\sigma_{ism} = \frac{P_m}{\delta \cdot d}. \quad (27)$$

Conclusion. Predstavlena IUthenwild dLakewill toIZStart construktyvno technological parameters hammer crushers in line pelleting biomass for energy purposes

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Proanalyzyrovanы suschestvuyuschye constructive and technological methods of calculation molotkovoy crushers and held usovershenstvovanye s about A yzmelchenyya byomassы for production lines hranulyrovannoho byotoplyva.

Molotkovaya drawbylka, Plotness materyala, CRITICALI lyneynaya velocity of the rotor, rotor diameter, length of the rotor.

The existent methods of structural-technological calculation of hammer crusher are analysed and their improvement is conducted in relation to growing of biomasses shallow for the lines of production of granular biopropellant.

Hammer crusher, closeness of material, stalling linear speed of rotor, diameter of rotor, length of rotor.

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Solution composition manure runoff CATTLE AT anaerobic fermentation in bioreactors

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The technology of processing solutions cattle manure in biogas plants in. V.Krupil "Ukrainian dairy company". It is shown that the effective operation of bioreactors with regulations is a technological parameter and sustainable alkaline mode, which must be carefully maintained.

Organics, Fermentation, perebrodzhenyy solution bioreactor.

Resolutionska problem. Agricultural industryindustrial complex (APC) in Ukraine today - is one of the few sectors that in the current environment evolves. [1] Livestock, as one of the sectors of agriculture, is also steadily growing. So the question of disposal of organic waste. Recycling organic waste leads to significant savings in valuable energy resources, as well as products that