11. Shvedyk MS, Reshetylo AM Analysis of the accession process in closet seed sowing conical element. Scientific notes. Interuniversity collection. Vyp.19- Luck, 2007, s.383-389.

In this article are presented vhozhdenyya Semen analysis process in cell vыsevayuscheho element, kotorыy realyzuetsya putem ego zatalkyvanyya Under pressure action grain layer in a bunker IZ Trejo varyantov with odnovremennыm: pryzhatyem Semen basis for the cell; with rotation and odnovremennыm vыtalkyvanyem for predelы cell pervogo Semen and zatalkyvanyem on ego mesto sosedneh; Semen with turning back and forth.

Vыsevnoy element, kamorka, bunker semya, layer of, pressure of, force, torque, zatalkyvanyya, turn.

In paper an analysis over of process of including of pip is brought in the closet of sowing element which will be realized by her pushing under the action of pressure of grain-growing layer in a bunker after one of three variants with simultaneous: pinning of pip against basis of closet; with a rotation and simultaneous extrusion outside the closet of the first pip and pushing into her place of nearby; with the turn of pip back forward.

Seed element chamber, hopper, seed layer, pressure, force, torque, zashtovhuvannya, turn.

631,372 UDC: 62-843

EQUATION Machine Dynamics-TRAKTORNOHO Units

GA Holub, PhD
VV Chub, applicant

The equation of motion dynamics machine-tractor unit when running on biodiesel on the performance of manufacturing operations.

Dynamics, machine-tractor unit, diesel biofuel.

Problem. Assessment of the feasibility of power means the power to the machines and tractor unit (AIT) in various operating conditions in the application of appropriate agricultural machines and the type of fuel remains a major operational issue.

Energy performance MTA in the interaction workspaces vary within wide limits, which in turn is reflected in the technical and economic performance, especially fuel consumption and runtime manufacturing operations. Addressing Mr.ytannya relationship between the parameters of the MTA in the performance of manufacturing operations willptymizuvaty his work on different fuels.

Analysis of recent research. On the need to determine the right balance between power, weight, working speed of agricultural machinery and forces arising in their interaction pointed out in his paper is VP Horyachkin [1].

In the works [2, 3] AIT is considered as a system of rigid bodies interconnected as rigid and elastic elements at work which the entire body system performs translational motion, with force and moments are based on the balance of power and moments of inertia of rotating masses. The equation of the unit and the balance of points in [4] presented based on the fact that the increase in kinetic energy equal to the work of all forces acting at a point of the. The study of railroads made a great contribution to VN Boltynskyy that in [5] resulting equations allow for the non-regularity of dynamic characteristics of the engine and points of resistance unit based on the equation of moments of inertia. In [6] dependence of Traction MTA on the type of fuel and its presentation.

The analysis of the literature points to the need to clarify the dynamic equations MTA and bring it to a form suitable for practical application.

The purpose of research - intochnyty equation dynamics of AIT when running on biodiesel on the performance of manufacturing operations.

Results. To solve this problem made power analysis of AIT (Fig. 1).

The torque of the engine to the driving wheels elevated power means is spent on them slipping and create traction MTA. Traction torque on the wheel can present a pair of tangential forces are exerted on FTK outer contour wheels one of which compensates for the effect of coupling and the other creates a tractive force on the wheel. By direction of the force coincides with the direction of rotation of the wheel around a central axis which is enclosed torque. If a wheel loses grip point with the ground, all the torque is spent on increasing the frequency of rotation of the wheel.

The interaction of wheels with soil, under the weight of the tractor at the point of contact occurs Strength FZCH which prevents rotation of the wheel and tangential to the wheel at the point of adhesion. Force grip, balancing one of a pair of forces torque wheels that grip force is directed opposite FZCH, creating instantaneous center of rotation at the point of contact of the wheel with the surface of the soil. Another strength of the force couple wheel torque which is directed in the direction of the tractor forms around the time of the instantaneous center of rotation.

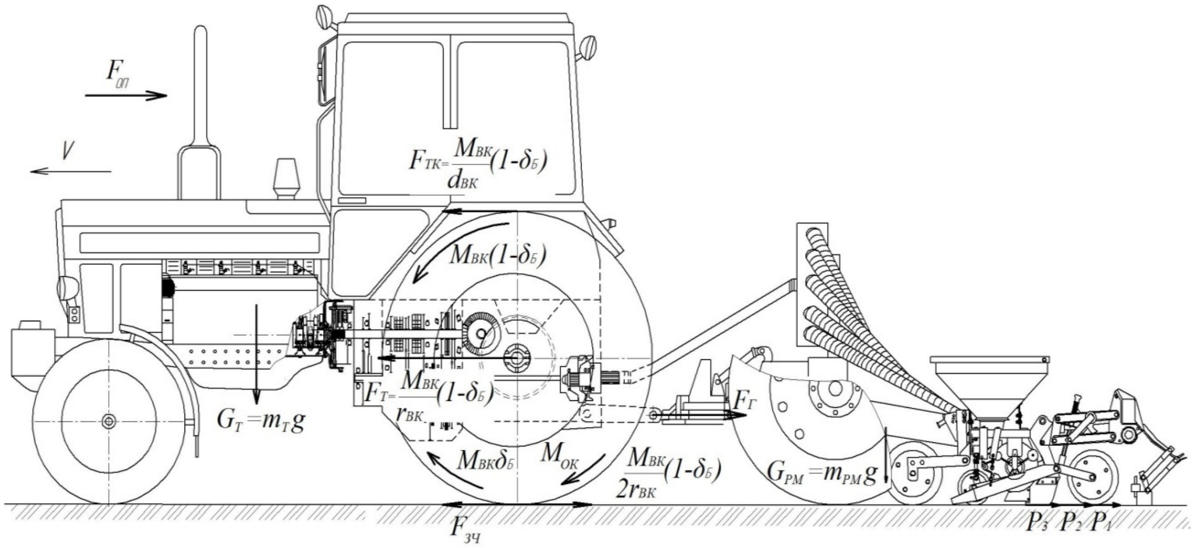

Fig. 1. Scheme of forces acting on the MTA:*ERM*- Torque Slip, IOC - time to overcome rolling resistance, FTK - Tractor thrust of torque to the wheel, FT - thrust tractor brought to the axis of the wheel, FZCH - the force of adhesion to the surface, fg - traction resistance force working machine , FOP - the force of air resistance, GT - the weight of the tractor GRM - weight of working machine.

The traction force on the wheel FTK always trying to crank the wheel around the instantaneous center of rotation, constantly creating new instantaneous center of rotation, thereby carried forward movement. Considering the wheel hard to the end of the lever which operates traction force on the wheel, the effort of it will be transmitted to the axle. Tractive force that occurs on the axis of the wheel can be determined from the equation of conservation of angular lever fixed to an instantaneous center of rotation:

$$F_{ТК} d_{ВК} = F_Т r_{ВК} \text{ Where } F_Т = \frac{F_{ТК} d_{ВК}}{r_{ВК}} = 2F_{ТК} \quad (1)$$

where dVK - driving wheel diameter, m;

According to [6], tractive force's work in diesel biofuel define the expression:

$$F_Т = \frac{1}{r_{ВК}} \left(\frac{S_{ПЛ} l_{ПЛ} \rho_П k_{ПЛ} i Q_Н \eta_{ЕДП} k_{ЗМДБП}}{2\pi} - \frac{M_{ВВП}}{i_{ТРВВП} \eta_{ТРВВП}} \right) (1 - \delta_Б) i_{ТРВК} \eta_{ТРВК} \quad (2)$$

where SPL - area plunzhernoj couples m2; lPL - active course plunger, m; ρP - density fuel, kg / m3; kPL - the coefficient of the fuel supply plunger injection pump, i - number of fuel injections per engine revolution, at 1; QH - net calorific value of the fuel, J / kg; ηEDP - effective efficiency of the engine on diesel fuel, ratio. ed .; kZMDBP -

reduced efficiency coefficient of efficiency of the engine when using biodiesel, ratio. ed .; iTRVVP - The gear ratio transmission from the engine to the PTO, units.; ηTRVVP - efficiency transmission PTO, ratio. ed .; MVVP - working machine torque on PTO, NM; *δB* -factor of power losses in the drive wheels slipping, relative. ed .; iTRVK - The gear ratio transmission from the engine to the drive wheels, from.; ηTRVK - efficiency transmission power means, relative. units.

According to Newton's second law MTA dynamics can be described by the following equation:

$$m_{MTA}\frac{dV}{dt} = F_T - F_{OK} - F_{O\Pi} - F_{\Gamma}, \quad (3)$$

where m_{MTA} – mass MTA as part of the tractor and working machine, kg; $\frac{dV}{dt}$ – MTA linear acceleration, m / s2; V - velocity ITA m / s; dt - time change movement ITA, s; FOK - the power to overcome rolling resistance when moving the tractor, N; FOP - the force of air resistance when moving the tractor, N; Fg - traction resistance force working machine, NM

In equation (3) expressing the velocity of the MTA through the angular speed of the crankshaft of the engine, traction MTA according to (2), traction resistance of agricultural machinery by rational formula V. Horyachkina [1], the strength to overcome rolling friction wheels and air resistance when moving according to known formulas [2], we obtain:

$$\frac{(m_T + m_{PM})r_{BK}(1-\delta_Б)}{i_{TPBK}}\frac{d\omega}{dt} = \left(\frac{S_{ПЛ}l_{ПЛ}\rho_{П}k_{ПЛ}iQ_H\eta_{ЕДП}k_{ДБП}}{2\pi} - \frac{H_{PM}Q_{PM}}{\eta_{PM}\omega_{PM}i_{TPBBП}\eta_{TPBBП}}\right)r_{BK}^{-1} \times$$
$$\times(1-\delta_Б)\eta_{TPBK}i_{TPBK} - fm_T g - \frac{k_{ОБТ}S_{ЛОБ}\omega^2 r_{BK}^2(1-\delta_Б)^2}{i_{TPBK}^2} - f^{/}m_{PM}g - kab - \quad (4)$$
$$-\theta ab\left[\frac{\omega}{i_{TPBK}}r_{BK}(1-\delta_Б)\right]^2$$

where Mt - tractor weight, kg; *mRM* - Mass of the working machine, kg; *Amsl* - The pressure created by the fan working machine, Pa; QRM - volumetric air flow fan working machine, m3 / s; η_{RM} - Efficiency fan working machine; from. ed .; *ωRM* - Angular rotational speed of the working machine, rad / s; f - coefficient of rolling resistance wheels, ratio. ed .; g - acceleration due to gravity, m / s2; kOP - coefficient of air resistance, H c2 / M4; SLOB - area drag ITA m2 .; $f^{/}$ – summary friction coefficient that includes friction tool about soil and rolling friction support wheel plow, ratio. units; k - resistivity soil deformation, N / m2; and - the width of the treated layer, m; b - the processing layer depth, m; θ - coefficient that depends on the ratio of the speed of the rejection of the reservoir and speed the plow, Ns2 / M4.

Note also that the effective efficiency of the engine on diesel fuel varies depending on the mode of the engine within wide limits, therefore, to obtain reliable data in dynamic equations must enter dependence of the efficiency of the engine on the angular speed of the crankshaft. For engine D-245.7E2, under experimental external high-speed performance, efficiency varies by law:

$$\eta_{ЕДП} = \alpha\omega^2 + \beta\omega + \gamma \qquad (5)$$

where α, β, γ - approximation coefficients (α = -0,00000617, β = 0,001781, γ= 0.271482).

By entering into the equation (4) external parameters speed characteristics according to equation (5), we obtain:

$$\frac{(m_Т + m_{РМ})r_{ВК}(1-\delta_Б)}{i_{ТРВК}}\frac{d\omega}{dt} =$$

$$= \left(\frac{S_{ПЛ} l_{ПЛ} \rho_П k_{ПЛ} i Q_Н (\varepsilon\omega^2 + \beta\omega + \gamma) k_{ЗМДБП}}{2\pi} - \frac{H_{РМ} Q_{РМ}}{\eta_{РМ}\omega_{РМ} i_{ТРВВП}\eta_{ТРВВП}}\right) r_{ВК}^{-1} \times$$

$$\times (1-\delta_Б)\eta_{ТРВК} i_{ТРВК} - f m_Т g - \frac{k_{ОБТ} S_{ЛОБ} \omega^2 r_{ВК}^2 (1-\delta_Б)^2}{i_{ТРВК}^2} - f' m_{РМ} g - kab - \qquad (6)$$

$$-\theta ab\left[\frac{\omega}{i_{ТРВК}} r_{ВК}(1-\delta_Б)\right]^2$$

Introducing options:

$$A = \frac{(m_Т + m_{РМ}) r_{ВК}(1-\delta)}{i_{ТРВК}};$$

$$G = \frac{S_{ПЛ} l_{ПЛ} \rho_П k_{ПЛ} i Q_Н \eta_{ЗМДБП}}{2\pi r_{ВК}}(1-\delta_Б)\eta_{ТРВК} i_{ТРВК};$$

$$H = \frac{H_{РМ} Q_{РМ}}{r_{ВК}\eta_{РМ}\omega_{РМ} i_{ТРВВП}\eta_{ТРВВП}}(1-\delta_Б)\eta_{ТРВК} i_{ТРВК};$$

$$I = f m_Т g + f' m_{РМ} g + kab;$$

$$C = \frac{k_{ОБТ} S_{ЛОБ} r_{ВК}^2 (1-\delta_Б)^2}{i_{ТРВК}^2} + \theta ab\left[\frac{1}{i_{ТРВК}} r_{ВК}(1-\delta_Б)\right]^2,$$

get:

$$A\frac{d\omega}{dt} = G(\alpha\omega^2 + \beta\omega + \gamma) - H - I - C\omega^2. \qquad (7)$$

After the introduction of replacements $P=\frac{G\alpha-C}{A}$; $L=\frac{G\beta}{A}$; $K=\frac{G\gamma-H-I}{A}$, Equation (6) becomes:

$$\frac{d\omega}{dt}=P\omega^2+L\omega+K \text{ Or } \frac{d\omega}{P\omega^2+L\omega+K}=dt. \quad (8)$$

After integrating the differential equation (8) we get:

$$\frac{1}{\sqrt{L^2-4PK}}ln\left|\frac{2P\omega+L-\sqrt{L^2-4PK}}{2P\omega+L+\sqrt{L^2-4PK}}\right|=t, \quad (9)$$

where t - time, s.

Substituting the limits of integration in equation (9) we get:

$$ln\left|\frac{2P\omega+L-\sqrt{L^2-4PK}}{2P\omega+L+\sqrt{L^2-4PK}}\right|-ln\left|\frac{2P\omega_{\Pi}+L-\sqrt{L^2-4PK}}{2P\omega_{\Pi}+L+\sqrt{L^2-4PK}}\right|=t\sqrt{L^2-4PK}. \quad (10)$$

Getting rid of the log in the left side of the equation we get:

$$\frac{(2P\omega+L-\sqrt{L^2-4PK})(2P\omega_{\Pi}+L+\sqrt{L^2-4PK})}{(2P\omega+L+\sqrt{L^2-4PK})(2P\omega_{\Pi}+L-\sqrt{L^2-4PK})}=\exp(t\sqrt{L^2-4PK}).$$

After completing the transformation of the equations concerning provision speed of the crankshaft ω, we obtain:

$$\omega=\frac{L\left(\frac{2P\omega_{\Pi}+L-\sqrt{L^2-4PK}}{2P\omega_{\Pi}+L+\sqrt{L^2-4PK}}\exp\left(t\sqrt{L^2-4PK}\right)-1\right)}{2P\left(1-\frac{2P\omega_{\Pi}+L-\sqrt{L^2-4PK}}{2P\omega_{\Pi}+L+\sqrt{L^2-4PK}}\exp\left(t\sqrt{L^2-4PK}\right)\right)}+$$
$$+\frac{\sqrt{L^2-4PK}\left(\frac{2P\omega_{\Pi}+L-\sqrt{L^2-4PK}}{2P\omega_{\Pi}+L+\sqrt{L^2-4PK}}\exp\left(t\sqrt{L^2-4PK}\right)+1\right)}{2P\left(1-\frac{2P\omega_{\Pi}+L-\sqrt{L^2-4PK}}{2P\omega_{\Pi}+L+\sqrt{L^2-4PK}}\exp\left(t\sqrt{L^2-4PK}\right)\right)}. \quad (11)$$

After putting in equation (11) substitutions:

$$J=\sqrt{L^2-4PK};\ S=\frac{2P\omega_{\Pi}+L-\sqrt{L^2-4PK}}{2P\omega_{\Pi}+L+\sqrt{L^2-4PK}}e^{tJ},$$

it takes the form:

$$\omega=\frac{J(S+1)+L(S-1)}{2P(1-S)} \text{ Or } \omega=\frac{1}{2P}\left(J\frac{(S+1)}{(1-S)}-L\right). \quad (12)$$

To simplify the equation (12) will transform arithmetic expression $\frac{(S+1)}{(1-S)}$:

$$\frac{(S+1)}{(1-S)}=\frac{\left(\frac{2P\omega_{\Pi}+L-\sqrt{L^2-4PK}}{2P\omega_{\Pi}+L+\sqrt{L^2-4PK}}e^{tJ}+1\right)}{\left(1-\frac{2P\omega_{\Pi}+L-\sqrt{L^2-4PK}}{2P\omega_{\Pi}+L+\sqrt{L^2-4PK}}e^{tJ}\right)}=$$

$$=\frac{\frac{(2P\omega_{\Pi}+L-J)e^{tJ}+2P\omega_{\Pi}+L+J}{2P\omega_{\Pi}+L+J}}{\frac{2P\omega_{\Pi}+L+J-(2P\omega_{\Pi}+L-J)e^{tJ}}{2P\omega_{\Pi}+L+J}}=$$

$$=\frac{(2P\omega_{\Pi}+L-J)e^{tJ}+2P\omega_{\Pi}+L+J}{2P\omega_{\Pi}+L+J-(2P\omega_{\Pi}+L-J)e^{tJ}}=$$

$$=\frac{2P\omega_{\Pi}e^{tJ}+Le^{tJ}-Je^{tJ}+2P\omega_{\Pi}+L+J}{2P\omega_{\Pi}+L+J-2P\omega_{\Pi}e^{tJ}-Le^{tD}+Je^{tJ}}=$$

$$=\frac{2P\omega_{\Pi}(1+e^{tJ})+L(1+e^{tJ})+J(1-e^{tJ})}{2P\omega_{\Pi}(1-e^{tD})+L(1-e^{tJ})+J(1+e^{tJ})}=$$

$$=\frac{(1+e^{tJ})(2P\omega_{\Pi}+L)+J(1-e^{tJ})}{(1-e^{tJ})(2P\omega_{\Pi}+L)+J(1+e^{tJ})}=\frac{2P\omega_{\Pi}+L+J\frac{(1-e^{tJ})}{(1+e^{tJ})}}{(2P\omega_{\Pi}+L)\frac{(1-e^{tJ})}{(1+e^{tJ})}+J}.$$

With this in mind, the solution to the differential equation of motion dynamics ITA becomes:

$$\omega=\frac{1}{2P}\left(J\left(\frac{2P\omega_{\Pi}+L+J\frac{(1-e^{tJ})}{(1+e^{tJ})}}{(2P\omega_{\Pi}+L)\frac{(1-e^{tJ})}{(1+e^{tJ})}+J}\right)-L\right). \qquad (13)$$

Thus, an equation that describes the dynamics of change of angular speed of the crankshaft of the engine when changing external parameters that characterize the work of MTA in the performance of manufacturing operations and use the appropriate type of fuel. This expression contains the constants of differential equations that depend only on the fuel supply and fuel - L (s-1), as well as fuel, and fuel load ITA - P (Rel. Units.) And J (p-1).

Conclusion. The equation to determine the dynamics of the angular velocity of the crankshaft of the engine and linear motion MTA when changing the load, fuel and fuel, as well as perform the changes for the performance of the MTA when switching to diesel biofuel.

References

1. *In Horyachkyn.P.* Sobranie sochynenyy in 3 volumes / *In the.P.Horyachkyn*. [Ed. ND Luchynskoho].- 2nd edition - M.: Ear1968.
2. *Traktoгы* and cars / Under the editors VA Skotnykova. - M .: Agropromizdat, 1985. - 440 p.
3. *Fundamentals* theory of the car and tractor / DA Chudakov. - M .: Selhozyzdat, 1962. - 312 p.
4. *Svyrschevskyy BS* Эkspluatatsyya tractor fleet / BS Svyrschevskyy // Tutorial for in-ing a factor. mechanization and эlektryfykatsyy SH - M .: Selhozhyz, 1958. - 660 p.
5. *Boltynskyy VN* Business tractor engine at neustanovyvsheysya load / VN Boltynskyy. - M .: Selhozhyz, 1949. - 216 p.
6. *Golub, GA* Definition Traction power means when working on biodiesel / GA Golub, V. Chub // Mizhvid. temat. Science. Coll. NSC "IMESH" NAAS "Mechanization and Electrification of Agriculture." - Glevaha NSC "IMESH", 2013. - Vol. 98, v. 2 - 590 p. - P. 135-144.

Will provide a dynamics equation of motion tractor unit for the work to perform in diesel byotoplyve of technological operations.

Dynamics, Machine-Tractor unit, diesel byotoplyvo.

The dynamics equation motion of machine-tractorunits with using biodiesel in the performance of technological operations is received.

Dynamics, tractor operated machinery, biodiesel.

UDC 620.92 (477/1)

ANALYSIS OF THE ENERGY POTENTIAL OF BIOMASS IN UKRAINE

OI Eremenko, Ph.D.

Determined energy feasibility and prospects for production in Ukraine fuel from recycled biomass.

Biomass, biofuels production, bioenergy and prospects.

Problem. Biomass - a total mass of organic matter from plants and animals, renewable per unit area. Primary biomass - are plants, animals, microorganisms. Secondary biomass - a waste by-products and processing of primary biomass [1-3].

Annual growth of terrestrial biomass in the world is around 400 billion. T. The energy content of biomass growth equivalent to 3000 EJ (1021 J) / year, which is almost 8 times the consumption of all forms of