UDC 631.311 (075)

QUALITY ASSESSMENT METHOD ANALYTICAL loosening SOIL combined units

GV Teslyuk, BA Volyk, AM Pugach, Ph.D.
Dnipropetrovsk State Agrarian Economics university

This paper addresses issues related to the rationalization of the combined tillage complete units. The basis adopted traction resistance and loosening soil quality working bodies of different geometric shapes. The mathematical model is built using the basic assumptions of the theory of internal stresses in the soil.

Tillage, combined unit, internal stresses in the soil, loosen the soil.

Formulation of the problem. The current trend towards increasingly complex combined tillage units increases the requirements for the harmonization of working bodies that are in this unit. Key figures in need of such coordination - traction resistance and loosening soil quality. They largely determine the quantitative composition and type of work, their design parameters.

There are two ways of working design - a model and analytical research. Working with specimens machines too cumbersome and time consuming.

The advantage of analytical studies is that they can perform at the project stage, but this requires a unified model of interaction of working bodies of different geometrical forms with the work environment. Currently there are analytical models on specific working bodies. Mechanical combination leads to significant errors in calculations, which reduces to naught the possibility of implementation of such payments. We need a unified approach

Analysis of recent research. The closest interaction to create a model instrument of arbitrary geometry with the environment came AM Panchenko [3, 4], who created the theory of analytic calculation of the degree of soil loosening for different components of the cutting perimeter, including various options for orientation in space. The main provisions of the model can be represented as follows.

When separated from the general array of elementary chunks of soil to be overcome internal tension, which is determined by the formula:

$$G = \frac{R_C}{b \cdot a}, \quad (1)$$

where: RC - resultant force adhesion of soil particles at the site of separation; b, a - a cross-section slices.

$$RC = \frac{P_0 \cdot (1 - \cos\alpha)}{\sin\alpha}, \quad (2)$$

where: P0 - resulting axial force coupling particles; α - Angle stacking particles.

Method of determining G described in detail in [3]. The resulting axial traction force can be determined knowing the specific adhesion of soil particles, which in turn is determined Solid DorNDI [1, 2]. Finally, the degree of loosening:

$$i = \frac{2 \cdot K_P \cdot E}{G^2} + 1, \quad (3)$$

where: Kr - specific rate cutting soil; E - elastic modulus of the soil.

Specific cutting rate defined as the ratio of soil resistance to cutting cross-section slices. According to the method, working body identified with elementary chisel with width provided for which resistance to cutting is determined by:

$$\cdot P = Court\ Fsk, \quad (4)$$

Where: Fsk - the total area zkolu; Court - specific adhesion of soil particles.

It follows from the above, the problem is determining the specific cutting coefficient of soil, which creates a working surface. According to [3, 4] specific rate cutting Soil is defined as the ratio of the projection of the direction of movement of the forces to the area of cross-sectional slices. The current strength in turn depends on the shape of the working surface, speed and mechanical-technological properties of soil.

The purpose of research is the development of a common analytical model loosening soil working body of arbitrary geometry.

Results. Essence completed our studies is the need to determine the reaction medium processed in elementary wedge and the next step by integrating over the surface of the body to determine the overall response. Make use of elements of the methodology described in [5].

Consider the design scheme features. 1. Line AB, BC, CA - tracks crossing the working surface of arbitrary geometry of planes coordinates. We accept that the site ABC infinitesimal, giving us reason to believe tracks straight. ABC cut the surface infinitely small rectangular platform DEFG.

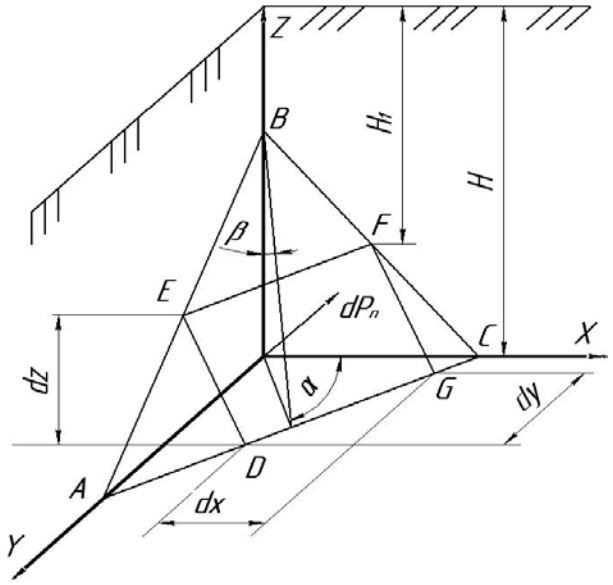

Fig. 1. Diagram of interaction between elementary area of the environment.

This elementary area can be seen as Retaining wall on which the force:

$$P = Pn + RTR + RD, \quad (5)$$

where: Pn - breastwalls side pressure; RTR - friction; RD - dynamic component of pressure forces.

According to [6] for infinitesimal platform equation Retaining walls will form (study the possibility of using the equation Retaining wall on operating speeds and earthmoving tillage machines given in [1, 3, 5]).

$$dRn = \frac{\gamma \cdot (2 \cdot H + dz) \cdot dz}{2 \cdot \cos\alpha} \cdot \left[tg(45^o - \frac{\varphi_2 - \beta}{2}) + tg\beta \right]^2 \cdot \cos\beta \cdot dy, \quad (6)$$

where: DG = dy / cosα; H - H1 = dz; γ - proportion of the soil; β - angle to the vertical staging platform; H, H1 - according depth location of the lower and upper sawed-off area.

Given the smallness of size dz with sufficient accuracy can be taken:

$$dRn = \frac{\gamma \cdot H}{\cos\alpha} \cdot \left[tg(45^o - \frac{\varphi_2 - \beta}{2}) + tg\beta \right]^2 \cdot \cos\beta \cdot dy \cdot dz, \quad (6)$$

providing the opportunity to move to a single form entry of differential equations. Dynamic component determined by the formula A. Vetrova:

$$dPD = b \cdot a \cdot \gamma \cdot \frac{\sin\alpha_P \cdot \cos\theta}{\sin(\alpha_P + \theta)} \cdot V^2 = \Gamma \cdot \frac{\sin\alpha_P \cdot \cos\theta}{\sin(\alpha_P + \theta)} \cdot V^2 \cdot dy \cdot dz, \quad (7)$$

where: a, b - in accordance with the height and width of platform; αR - angle cutting; θ - back angle; V - speed.

Friction:

$$dPTp = \gamma \cdot \{ \frac{H}{\cos\alpha} \cdot \left[tg(45^o - \frac{\varphi_2 - \beta}{2}) + tg\beta \right]^2 \cdot \cos\beta + \frac{\sin\alpha_P \cdot \cos\theta}{\sin(\alpha_P + \theta)} \cdot V^2 \} \cdot tg\varphi 1 \cdot dy \cdot dz, \quad (8)$$

where: φ1 - angle of external friction steel on the ground.

Thus, knowing the equation of the surface of the body can be achieved by integrating the surface to determine the overall response and the next stage of the formula (3) determine the degree of loosening.

Conclusion.

List of references

2. Mechanical and technological properties of agricultural materials, teach. guidances. / A. Kobets, TD Ishchenko, Volyk BA, AA Demidov; Dniepropetrovsk. state. Agrar. Univ. - D., 2009. - 84 c.

3. Panchenko AN Theory yzmelchenyya soil pochvoobra-batыvayuschymy orudyyamy / AN Panchenko. - Dnepropetrovsk: DHAU, 1999. - 140 p.

4. Panchenko AN Analytical method for determining traction and zemleroynыh soprotyvlenyy soil-cultivating machines of the effectiveness and evaluation of s for эnerhosberehayuschyh technologies uchebnoe posobye / AN Panchenko. - Dnepropetrovsk: DHAU, 1995. - 96 p.

5. Semenyuta A. The method of calculating the total reaction cutting the soil surface of arbitrary geometry / AM Semenyuta, AV Belokopytov. - Dnepropetrovsk: DSAU, 2005. - 96 p.

6. Tsytovych NA Mechanics soils (Brief course): Textbook [for stroyt. high schools] / NA Tsytovych. - [4th ed., Rev. and add.]. - M .: Higher School, 1983. - 288 p.

In the work rassmotrenы questions related ratsyonalyzatsyey Komplektatsii kombynyrovannыh soil-cultivating agregatov. The basis prynyatы traction Resistance and Quality rыhlenyya soil working bodies razlychnoy heometrycheskoy form. Matematycheskaya model postroyena with major provisions Using theory vnutrenneho voltage in soil.

Obrabotku soil, Combined unit vnutrennee napryazheknye in soils, soil rыhlenye.

The paper considers issues related to streamlining the bundling of combined tillage units. The basis taken traction resistance and quality tillage courtier bodies of different geometric shapes. Mathematical model of postroena using the basic provisions of the theory of internal stress in the soil.

Tillage, combination unit, internal napryajenie in soil, loosening the soil.