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BACKGROUND PARAMETERS harvesting-transport complex for sugar beet

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Aboutbrґruntovana rational method of determining the parameters of assembly-transport complex for sugar beet in the application of advanced streaming technology

Sugar beets, carriage, Minimizing soil compaction, productivity.

Problem. In the complex of measures to improve the efficiency of collection and transport of sugar beet a significant role to play in the development and implementation of advanced technologies and facilities are designed to increase productivity, reduce production costs and addressing environmental pereuschilnennyam due to soil. Soil compaction increases significantly during the collection and transport of crops from the field in the application of powerful beet harvesters (hereinafter - BC) with a mass of only beet bunker 25-30 tons and heavy vehicles with gross weight over 40 tons.

Development and implementation of specialized tractor trailers, cranes (hereinafter - CCI) for the transportation of beet harvesting and handling of heavy road vehicles (hereinafter - ATZ) or piles has significant prospects for production, increases efficiency because harvesting and transport processes. But the lack of justification technique parameters Harvesters-transport sector (hereinafter - ZTK) for advanced streaming technology significantly hinders implementation.

Analysis of recent research. Choice of rational operating parameters of assembly-transportnoy technology due to the presence of technical equipment, production conditions and the definition of one of the technologies, streaming, streaming-shipments or shipments.

Some reduction in labor costs and costs achieved with streaming technology, which is widely used in Ukraine [1-2]. But for beet harvesters nonstop considering long distance transportation requires a significant amount of ATZ. At the same time due to significant fluctuations in turnover ATZ simple BC awaiting transport up to 20% [3], and in pereuvolozhnenyh ATZ soils can not work in the field. Heavy ATZ significantly compacted soil, leading to its degradation and requires additional costs for loosening.

Improving flow technology by applying for the carriage of roots from BC to the edge of the field with CCI overload in heavy ATZ to a high degree eliminates the major disadvantages. In the Recently there were improved and BC specialized CCI: LS 16, LS18-2 with carrying respectively 16 and 18 tons (KLEINE). An important advantage of trailers to other vehicles (TC) is a reduced degree of pressure on the ground. In recent years, depending on the capacity hopper formed two classes of BC:

- 2-Axis combines with bunkers small capacity - 13 - 18 m3 (Agrifac WKM 9000, Kleine SF 10-2, SR 1800, and others). Prominent shestyryadnyh combine harvesters still have a winning position, since they are relatively light and have less ground pressure;
- 3-Axis combines high capacity with bunkers - 25-30 and 40 m3 (harvesters companies Kleine, ROPA and other places).

Combine first class works with two operating modes: load trailer beet-conveyors, which is nearby, and the accumulation of beet in the bunker at replacement vehicle for the production of heavy congestion ATZ.

Presented in this article is devoted to the substantiation of parameters ZTK using 2-axle BC bunkers with small capacity - 13-18 m3.

The purpose of research- Ppidvyschennya efficiency ZTK for sugar beet by applying advancedstreaming technology and the development of methods of rational justification parameters complex machines.

Results. Feature improved version of the technology is that the increase in productivity of collection and transportation of sugar beet is achieved by creating sustainable operational modes of the BC Chamber of Commerce and ATZ while reducing soil compaction.

BC Productivity per hour alternating time calculated by the formula:

$$W_K = W_{KP}\tau \text{ T / hr.} \quad (1)$$

where W_{KP} - The performance of BK 1 hour of normal time, t / h .;

τ - The use of variable rate time equal

$$\tau = \delta_{3M}\tau_{Ц} \quad (2)$$

where δ_{3M} – ratio of cyclic time equal to 0.9 for modern cars the EU;

$\tau_{Ц}$ - Ratio of cyclic time shifts:

$$\tau_{Ц} = \frac{t_{3AB.П} + t_H}{t_{3AB.П} + t_H + t_X} = \frac{t_{3AB.П} + t_H}{t_{3AB.П} + t_H + \frac{(t_{3AB.П} + t_H)(1-\varphi)}{\varphi}} = \varphi, \quad (3)$$

where $t_{3AB.П}$ - downloading CCI; t_H - downloading interim storage bin; φ - Working stroke rate, the average value of which according to the literature accepted as $\varphi = 0,9$ [4,5]; t_X - Duration of idling BC, which accounts for 1 duty cycle BC.

Combines working in relentless mode of operation using capacity hopper, and making long working runs, thus able to cover the possible traffic delays when not accompanied by a harvester moving along transport.The condition of flow of the first link "BC - CCI" [6] is equality:

$$R_m = I_П \text{, H} \quad (4)$$

where R_m - The rhythm of the group combines

$$R_m = \frac{T_{ЦК}}{m_K} \text{, H} \quad (5)$$

where $T_{ЦК}$ - The length of time, the mainobochoho cycle BK group harvesting;

m_K - The number of BC in the group;

IP- CCI interval receipt to the place of interaction with a combine, h .:

$$I_П = \frac{T_{ЦП}}{n_П} \text{, H} \quad (6)$$

where $T_{ЦП}$ - The duration, theobochoho cycle CCI; $n_П$ - The number of CCI for maintenance of harvesting.

Thus, during operation of the BC Chamber of Commerce and have: $\frac{T_{ЦК}}{m_K} = \frac{T_{ЦП}}{n_П}$.

Hence,

$$n_П = \frac{m_K T_{ЦП}}{T_{ЦК}} \text{, Ed.} \quad (7)$$

Rhythm of the combine is its duration, theobochoho cycleWhich in turn includes downloading CCI - $t_{ЗАВ.П}$ and bunker BC t_H:

$$T_{ЦК} = t_{ЗАВ.П} + t_H \text{, H.} \quad (8)$$

MAl downloading CCI CCI contains the filling of the hopper $t_{НП}$ and the live content (without work bunker) $t_{КП}$:

$$t_{ЗАВ.П} = t_{НП} + t_{КП} \text{, H.,} \quad (9)$$

where $t_{НП} = \frac{q_H}{W_{ПК}} + \frac{W_{КР}\frac{q_H}{W_{ПК}}}{W_{ПК}} = \frac{q_H(1+\frac{W_{КР}}{W_{ПК}})}{W_{ПК}}$; q_H - Capacity hopper BC - maximum weight of beets contained therein: $q_H = V_H d_B$, T; V_H - Capacity hopper BC m3; d_B - Beet bulk density, t / m3; $W_{ПК}$ - Performance vygruznogo conveyor BC t / h.

$\frac{W_{КР}\frac{q_{Н}}{W_{ПК}}}{W_{ПК}}$ $t_{НП}=\frac{q_{Н}}{W_{ПК}}$. The direct filling hopper:

$$t_{КП}=\frac{q_{П}-q_{Н}(1+\frac{W_{КР}}{W_{ПК}})}{W_{КР}},$$

where $q_{П}$ - Load CCI, vol.

After substituting (9) of the component we obtain:

$$t_{ЗАВ.П}=\frac{q_{П}-q_{Н}}{W_{КР}}, \text{ H.} \qquad (10)$$

Duration loading hopper is $t_{Н}=\frac{q_{Н}}{W_{КР}}$.

With these values and components (8) duty cycle as determined BC

$$T_{ЦК}=\frac{q_{П}}{W_{КР}}, \text{ h.} \qquad (11)$$

From (7) Naidoo amount for maintenance of CCI combines both

$$n_{П}=\frac{m_{К}T_{ЦП}W_{КР}}{q_{П}}, \text{ Ed.} \qquad (12)$$

Duty cycle CCI contains the following components: it moves along with BC to load beets - $t_{ЗАВ.П}$; driving time to the edge of the field where the ATZ and return it to BC after overload beet body (s) ATZ - $t_{РУХ}$; duration overload beet body ATZ - $t_{ПЕР}$ considering necessary at this time to maneuver CCI; $t_{ОЧ}$ - Supply time waiting trailer-conveyors filling hopper BC:

$$I_{1}=T_{ЦП}=t_{ЗАВ.П}+t_{РУХ}+t_{ПЕР}+t_{ОЧ}, \text{h} \qquad (13)$$

where $t_{ПЕР}=\frac{K_{М}q_{П}}{W_{П}}$ - duration overload beet body ATZ;

$W_{П}$ - Performance vygruznogo conveyor CCI, t / h;

$K_{М}$ - Coefficient that takes into account maneuvering CCI while loading ATZ ($K_{М}$ = 1.5).

According to studies [7-8] $t_{РУХ}=0,09$ h.

Given the values of individual components and equation (13), theobochyy cycle CCI is:

$$T_{ЦП}=\frac{q_{П}-q_{Н}}{W_{КР}}+t_{РУХ}+\frac{K_{М}q_{П}}{W_{П}}+t_{ОЧ}=\frac{T_{ЦК}n_{П}}{m_{К}}=\frac{n_{П}q_{П}}{m_{К}W_{КР}}, \text{ h.} \qquad (14)$$

Hence we obtain:

$$t_{ОЧ} = \frac{q_П}{W_{КР}}(\frac{n_П}{m_К} - 1) + \frac{q_Н}{W_{КР}} - t_{РУХ} - \frac{K_М q_П}{W_П}, \text{ h.} \quad (15)$$

As the number of $T_{ЦП}$ depends on the number of CCI in ZTK, which is unknown to determine $n_П$ apply the value of the minimum cycle time $T_{ЦП}^{MIN}$ at $t_{ОЧ} = 0$:

$$T_{ЦП}^{MIN} = \frac{q_П - q_Н}{W_{КР}} + t_{РУХ} + \frac{K_М q_П}{W_П}, \text{ H.} \quad (16)$$

$$n_П = CEILING\frac{m_К T_{ЦП} W_{КР}}{q_П} = CEILING\frac{m_К T_{ЦП}^{MIN} W_{КР}}{q_П} = = CEILING\frac{m_К W_{КР}(\frac{q_П - q_Н}{W_{КР}} + t_{РУХ} + \frac{K_М q_П}{W_П})}{q_П} \text{ од.} \quad (17)$$

When calculating the amount of ATZ to ensure rational While a beet advisable to capacity equal to or ATZ was carrying multiple CCI q_A Ie:

$$q_A = \frac{q_П}{n} \text{ t,} \quad (18)$$

where n - Natural positive number; appropriate to its importance n = 1.

Number ATZ, which is necessary for continuous operation ZTK is the analysis of interaction machines second link "CCI - ATZ":

$$R_П = I_A, \text{ H.} \quad (19)$$

where Rp - rhythm of the CCI group is:

$$R_П = \frac{T_{ЦП}}{n_П}, \text{ H .;} \quad (20)$$

IA - ATZ interval income:

$$I_A = \frac{T_{ЦА}}{n_A}, \text{ H.,} \quad (21)$$

where n_A - Number of vehicles at the link;

$T_{ЦА}$ - Turnover duration (duty cycle) of one ATZ.

From equation (19) with (20), (21) we obtain the required number of ATZ:

$$n_A = CEILING\frac{m_К T_{ЦА} W_{КР}}{q_П}, \text{ com.,} \quad (22)$$

where $T_{ЦА}$ - Duration of traffic ATZ [4, 6]:

$$T_{ЦА} = 1,23(\frac{K_М \cdot q_П}{W_П} + \frac{2l_{ij}}{v_T} + t_{АВИВ}), \text{ H .;} \quad (23)$$

where l_{ij} - Distance transport, km; v_T - Average speed of technical ATZ km / h .; $t_{АВИВ}$ - Duration of discharge to the receiving point, h.

The use of this technique, consider an example.

Example. Sugar beet is going to a group of two combines SF 10-2 (Kleine) with specification: productivity BC W_{KP} = 108 t / h., With hopper q_H = 10 t capacity and unloading conveyor for beet $W_{ПК}$ = 720 t / h. Transportation from the field on the road is done trailer-conveyors LS 18-2 with $q_П$ = 18 t capacity and vygruznogo conveyor $W_П$ = 850 t / h, and cars - on the pitch at the reception center. Distance transportation - 10 km; Technical vehicle speed - 40 km / h., stay car at the receiving point - 0.1 hours. Define: BK productivity per hour alternating time required number of CCI; lead time for trailer-conveyors on hold filling hopper BC; capacity and number of ATZ. Solution:

1. Performance BK hour alternating time is given by (1):

$W_K = W_{KP}\tau = 108 \cdot 0,81 = 87,48$ T / h, where $\tau = \delta_{ЗМ}\tau_Ц = 0,9 \cdot 0,9 = 0,81$.

2. The required amount of CCI according to (17):

$$n_П = CEILING\frac{2 \cdot 108(\frac{18-10}{108} + 0,09 + \frac{1,5 \cdot 18}{850})}{18} = 3$$ units.

3. lead time for trailer-conveyors on hold by filling hopper (15):

$$t_{ОЧ} = \frac{18}{108}(\frac{3}{2} - 1) + \frac{10}{108} - 0,09 - \frac{1,5 \cdot 18}{850} = 0,054$$ h.

4. Load ATZ from (18):

$q_A = \frac{q_П}{n} = 18$ t.

5. The required amount of ATZ determined from (22) as

$$n_A = CEILING\frac{2 \cdot 0,784 \cdot 108}{18} = 10 \text{ авт.}$$

where $T_{ЦА} = 1,23(\frac{1,5 \cdot 18}{850} + \frac{2 \cdot 10}{40} + 0,1) = 0,784$ *год*.

Conclusion. The technique of definition of rational parameters of assembly-transport complex for sugar beet, which provides improved itemotokovu of technology maintenance work combines nonstop, with a minimum number of vehicles and with decreasing soil compaction.

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Obosnovanaya Methods for determining parameters ratsyonalnыh uborochno transport complex for saharnoy beet in Application usovershenstvovannoy potochnoy technology.

Saharan beet, Transport of, mynymyzatsyya seal soil, proyzvodytelnost.

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THEORETICAL BASIS FOR CREATION OF TAPES PEREVERSTUVACHA hemp

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The theoretical justification perevertuvannya hemp stalks, design and manufacturing process perevertuvacha tapes dovhostebelnyh cultures.

Stlantseva Trust, process, assembly cannabis perevertuvach tapes.

Problem. Currently more prevalent technology of preparing hemp trusts way dewy lobe, which is combined with the process of collection and includes operations: cutting, spreading stems in ribbon and their subsequent selection.

Analysis of recent research. However, uniformity dewy lobe stems and the quality of the fibers are still low because of the relatively