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THE INFLUENCE OF TECHNOLOGICAL FACTORS ON THE ENERGY CONSUMPTION OF WORK OF THE CUT MASS ACCELERATOR

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Forage harvesters in modern design are powerful machines that ensure the harvesting of fodder according to agrotechnical requirements. The unloading channel in forage harvesters is made in such a way that the cut mass enters the vehicle for further transportation in the shortest time possible.

The accelerator in the unloading channel of the combine provides convenience in operation, allowing to load of cut mass into the vehicle at a distance of more than 10 m not only to the vehicles moving next to the combine but also behind it when mowing the swaths. The main function of the cut mass accelerator is to provide acceleration and formation of compactness of the flow of the cut mass after it passes through the grinding rollers.

Currently, the influence of the structural and technological parameters of the cut mass accelerator on the process of its unloading through the channel of the forage harvester has not been sufficiently investigated, therefore, for example, the substantiation of the technological parameters of the operation mode of the cut mass accelerator of the discharge channel of the forage harvester is relevant.

The object of the research is the process of transporting the cut stem mass by the combine accelerator through the unloading channel.

The purpose of the research is to experimentally establish the influence of technological factors in the process of transporting the cut mass of the harvester with an accelerator on the consumption of specific energy and the creation of effort on the shield catcher.

The objectives of the work are to study the state of the issue of the accelerators use of cut stem mass in the unloading channel of forage harvesters and their structural implementation; to carry out an analysis of research and publications on the acceleration of cut stem mass; to develop a method of experimental research and establish the influence of technological factors of the process of transportation of the cut stalk mass of the harvester with an accelerator on the consumption of specific energy and the creation of effort on the shield catcher.

The research methodology is experimental by determining the consumption of the specific energy of the accelerator, the effort created on the catcher shield, and the supply of the cut stem mass. Processing of experimental data is performed using methods of regression analysis and mathematical statistics.

As a result of the conducted experimental studies, it is established that the most significant of the studied technological factors (W, L_{cp}, q) is the supply of cut stem mass. An increase in the supply of crushed stalk mass of corn from 6 to 13 kg/s leads to both an increase in effort from 15 to 140 N (almost ten times) and an increase in specific energy consumption from 0.12 to 0.18 kJ/kg. An increase in the moisture content of the stem mass of corn from 54 to 76% leads to a decrease in the effort on the catcher shield and the specific energy consumption. The minimum values of the specific energy consumption of the accelerator in the range of 0.103-

0.105 kJ/kg are reached with a weighted average stem mass of 14-18 mm. The influence of technological factors on the process of transporting the cut stem mass by the accelerator of the harvester through the discharge channel is parabolic in nature.

The use of the cut stem mass accelerator leads to an increase in the effort on the catcher shield, which is an order of magnitude higher than without it, and a significant increase is observed at a supply over 6.5 kg/s.

Key words: *forage harvesters, accelerator, consumption of specific energy, effort, shield catcher, acceleration, supply, cut stalk mass, technological factors.*

F. 9. Fig. 7. Ref. 17.

1. Introduction

Ukraine is an agrarian country and occupies a prominent place in the world rankings for the production of certain types of plant products. The quality of livestock products depends on the conditions of cultivation and preparation of complete stem fodder. In a dairy cow's diet, stem fodder consumption should be at least 50%. The diet of cattle includes green fodder and its preservation products - silage, hay, and others. To reduce the cost of livestock products, the cultivation and procurement of cheap, high-quality stem fodder is a decisive factor.

Forage harvesters are equipped with various components that significantly improve the operation of the machine and ultimately ensure the implementation of the modern technological process of forage harvesting. One of these components is the accelerator of the cut mass, its main function is to provide acceleration and compactness of the flow of the cut mass after it passes through the crushing rollers.

Modern fodder harvesters ensure not only high work performance when harvesting fodder, but also the quality of grinding. This factor is especially important for harvesting corn silage, when, in addition to the knife cutter, a roller shredder is used, which ensures 97.5 to 99.0% grinding of corn grain. The roller shredder requires the use of a cut mass accelerator in the discharge channel of the forage harvester to ensure the stability and technological reliability of the process of loading the cut stem mass into vehicles.

2. Formulation of the problem

Forage harvesters in modern design are powerful machines that ensure the harvesting of fodder according to agrotechnical requirements. The unloading channel in forage harvesters is made in such a way that the cut mass enters the vehicle for further transportation in the shortest possible time. The discharge channel of the forage harvester contains the following main components: grinding rollers, accelerator of the chopped mass, and deflector.

The accelerator in the harvester's discharge channel ensures ease of operation, allowing to load of crushed mass into the vehicle at a distance of more than 7...10 m not only to the vehicles moving next to the combine but also behind it when mowing the swaths. The main function of the cut mass accelerator is to provide acceleration and formation of compactness of the flow of the cut mass after it passes through the grinding rollers.

The disadvantage of domestic forage harvesters (KPI-2.4A, KPF-2.4, KZS-125 "Boreks") is the absence of an accelerator of the cut mass in the discharge channel of the forage harvester, which significantly reduces the convenience of operation, and requires increased skill in driving vehicles.

Currently, the influence of the design and technological parameters of the cut mass accelerator on the process of its unloading through the channel of the forage harvester has not been sufficiently studied, therefore, the study of the influence of, for example, technological factors on the process of transportation of cut stem mass by the accelerator through the silo pipeline is relevant.

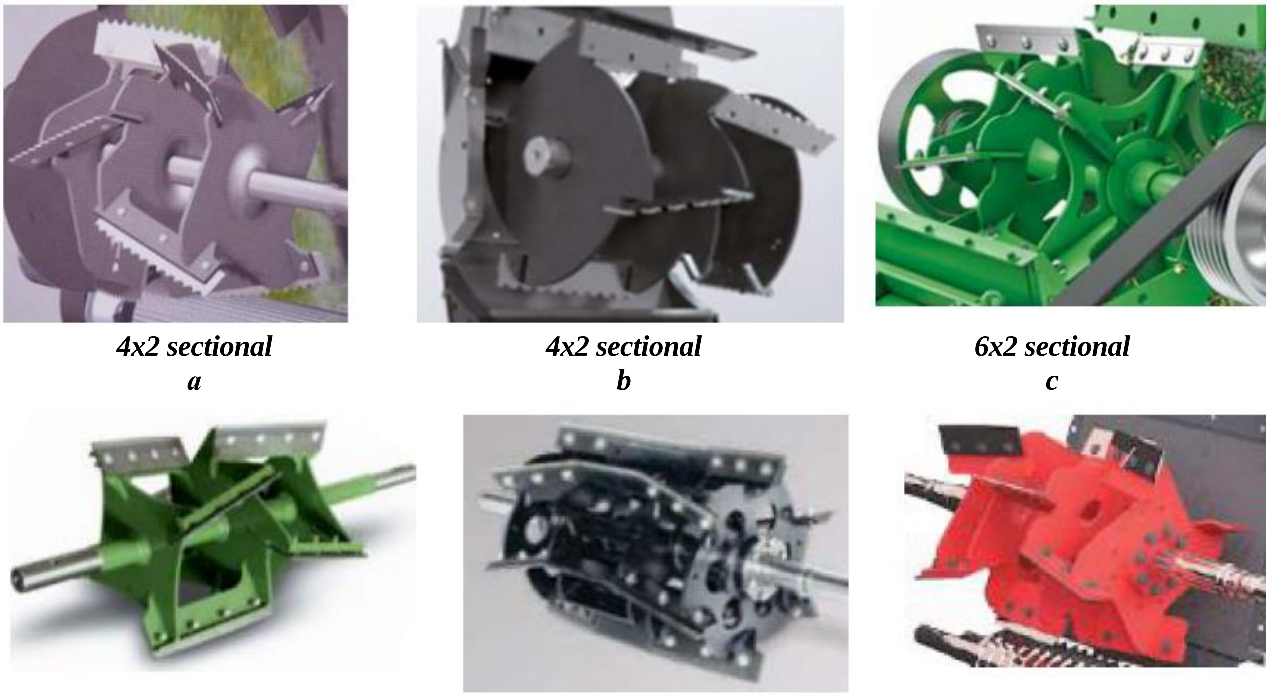
3. Analysis of last researches and publications

Currently, in Ukraine, a large percentage of domestic forage harvesting machinery is occupied by obsolete machines, is not mass-produced, and only partially meets the requirements for crushing stem mass. Therefore, in Ukraine, the KPI-2.4A, KP-2.4 trailed forage harvester is produced, and there were attempts to produce an analog of the E-281 "Maral-125" harvester, Borex OJSC and Advis OJSC. Due to the decrease in the number of cattle, these combines are produced only to order. The designs of these combine harvesters are outdated, they do not provide additional grinding of grain when harvesting silage from corn of waxy maturity. In connection with this, combines of foreign manufacturers have become widely used.

Accelerators are used to form a continuous mass flow after grinding it with rollers. Accelerators of various designs have been used since the middle of the last century. The basics of the theory of the process implemented by the cut mass throwers are described in [1] and by other authors. However, improving, accelerators in combines have changed. This is due to the passage through the discharge channel of the cut mass and the requirement for better loading of vehicles due to both the increase of the unloading height and the speed of the cut mass.

When harvesting silage, the use of a cut mass accelerator is an important and necessary element of the discharge channel design. The accelerator is installed in the discharge channel immediately behind the grinding rollers. This design of the unloading channel and the placement of its elements is the most effective [2].

The use of rational parameters in progressive design solutions of the cut mass accelerator makes it possible to use the working parts of the forage harvester with maximum efficiency. The cut mass accelerator with a V-shaped arrangement and displacement of the blades in rows has a continuous supply of mass to the body of the truck regardless of the crop and harvesting conditions. The general appearance of modern accelerators of various manufacturers is shown in Figure 1.



4x2 sectional — *a*; *4x2 sectional* — *b*; *6x2 sectional* — *c*

4x2 sectional — *d*; *6x3 sectional* — *e*; *4x3 sectional* — *f*

Fig. 1. General appearance of modern accelerators of various manufacturers:
a – Claas Jaguar, b – Fendt Katana, c – John Deere 8000, d – Krone BiG X,
e – New Holland FR, f – GomSelMash FS8060

Accelerators in forage harvesters are rotary, most often four-blade throwers with a diameter of 500-700 mm. In high-power harvesters, the rotors are made of two or three sections. The frequency of their rotation is commensurate with the frequency of rotation of the cutting drums, to ensure the equality of the speeds of the supply particles.

At the current stage of development of forage harvesters, a direct-flow forage unloading scheme is used. The mass without obstacles, in a powerful flow, passes the minimum path from the cutting drum to the deflector. Such a scheme not only contributes to high throughput but also the reliability of the technological process. The main manufacturers of forage harvesters produce a two-section cut mass accelerator with four blades per section with a V-shaped arrangement of blades.

Unloading silo pipelines of combine harvesters provide mass supply to a height of 3.75-6.4 m, which allows filling vehicles with high overhangs. The angle of rotation of the silo pipeline is more than 180° (190°-210°), which helps to work with heavy-duty vehicles with a body height of more than 5 m.

If it is necessary to increase the throwing speed, the distance between the rotor and the back wall of the channel is reduced. To reduce the throwing speed, the distance is increased. Adjustment of the accelerator to the required speed of ejection of the cut mass is performed by the operator during the movement of the forage harvester from the workplace.

The diameter of the accelerator ranges from 405 to 560 mm, and these dimensions are typical for combines and other manufacturers, which are within 525-560 mm, which is 10-18 % less than the diameter of the cutting drum of the combine.

The width of the accelerator corresponds to the width of the cutting drum and ranges from 506 to 780 mm with an average value of 682.5 mm and a coefficient of variation of 17 %. Almost all accelerators are two-sections with four blades in each section evenly spaced around the circle. Relative to both the direction of movement of the mass (the axis of the material pipeline) and the radius of the rotor, the blades have a deviation, which contributes to both the rapid descent of the accelerated mass from the blade and the concentration of the mass in the center of the silo pipeline.

Within the specified limits of parameters and operating modes, the accelerator reliably performs the mass unloading process for harvesters of various capacities.

The process of throwing cut stem mass was first described by Horyachkin V. P., the author conducted a kinematic and effort analysis of the process.

The recommendations developed by the author [3] made it possible to choose the structural and kinematic parameters of the shredding and throwing device depending on the selected technological scheme of the harvester. The dependences of the values of the coefficient of useful action of the cutting drum of the forage harvester for unloading the cut stalk mass on the speed of movement of particles and the indicator of the angle of deviation of the direction of motion of the particle from the plane of rotation are established.

A little later, based on the laws of classical mechanics, Vasylenko P. M. [4] developed, and in some cases, investigated the movement of a material particle on a rough surface, including a rotating one. The works of Vasylenko P. M. are a methodological basis for the study of kinematic indicators of the process of movement of particles of agricultural materials on rough rotating surfaces.

Bulgakov V. M. [5], determining the main regularities of the operation of a rotary with a horizontal axis of rotation, established the non-uniformity of the action of the blades in one trace on the raw material, determined the conditions for choosing the mechanical and geometric parameters of the arc-shaped blade, which ensure the maximum speed of interaction with the raw material at the initial moment.

There are studies of throwers with an axial supply of raw materials, but schemes with a tangential supply of cut mass used in a forage harvester [6, 7, 8, 9] were not studied.

Therefore, the issue of reducing energy consumption by accelerators with the direction of mass supply coinciding with the direction of its acceleration is not disclosed in the literature. In this regard, further research will be aimed at solving this issue.

4. The aim of the study

The purpose of the research is to experimentally establish the influence of technological factors in the process of transporting the cut mass of the harvester with an accelerator on the consumption of specific energy and the creation of effort on the shield catcher.

5. Presenting main material

An experimental setup was developed for conducting research, the diagram of which is presented in Figure 2.

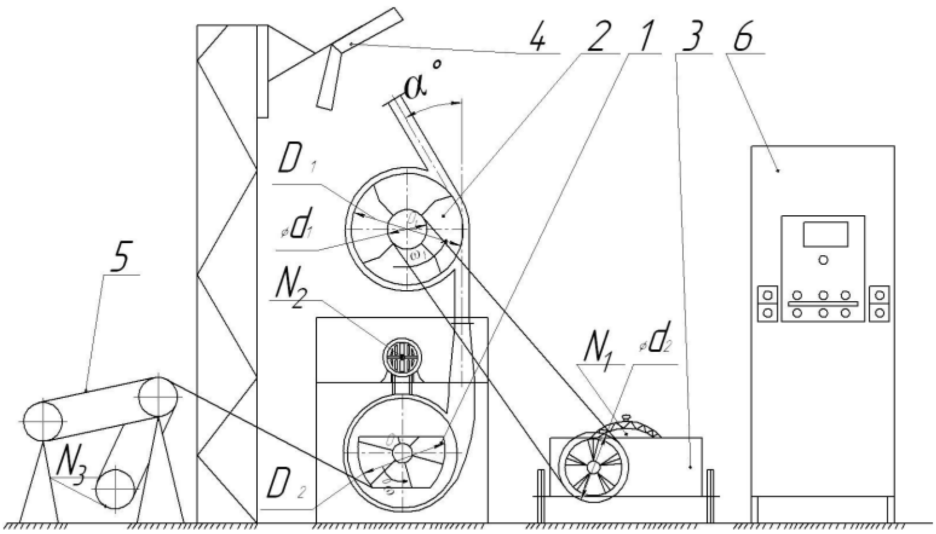
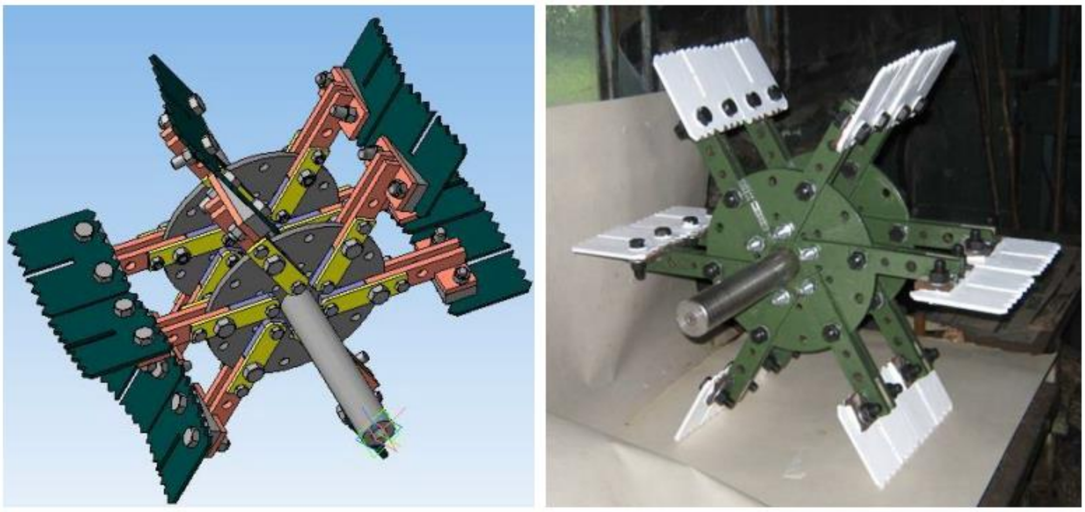


Fig. 2. Scheme of the experimental setup:
1 – drum; 2 – accelerator; 3 – variator; 4 – catcher shield; 5 – conveyor; 6 – control cabinet

Its main component is the rotor-drum 1, which is mounted on a frame and covered by a casing. The casing has a receiving neck and a discharge deflector directed to the top. The diameter of the drum rotor is 760 mm, it has 6 blades installed on the disc. An ASIB3-160L-15x1500 electric motor with a capacity of 15 kW and a rotation frequency of 1460 r/min was used for its drive. The electric motor is mounted on the same frame as the drum rotor. Owing to the belt transmission, the angular speed of the rotor-drum 1 is 85.3 $s^{-1,}$ and, accordingly, the circular speed of the ends of the blades is 32.4 m/s.

Accelerator 2 is installed on the same frame as rotor-drum 1, the basis of which is a rotor with two rows of six blades in a row (Fig. 3). The rotor is covered by a casing both on the sides and around the perimeter. The neck for supply the mass is located from below and is directed vertically (Fig. 2), and for mass ejection is from above and is directed at an angle $\alpha = 35°$ to the vertical. The design of the throwing rotor makes it possible to change its diameter, and the number of blades, and change the angle of their inclination to the plane of rotation.

Accelerator 2 (Fig. 2) is driven by an electric motor with a capacity of $N_1 = 14$ kW with a rotation frequency of 1460 r/min through a VTC-2 variator and a belt drive with pulleys $d_1 = 312$ mm and $d_2 = 235$ mm. This execution of the drive allows changing the frequency of rotation of the accelerator rotor in the range of 54.64 - 267.45 c^{-1}. A baffle is installed on the discharge nozzle of the accelerator, which narrows the mass flow and directs it to the catcher shield 4, installed at a distance of 1.05 m from the baffle. The peculiarity of shield 4 is that its receiving plane is set perpendicular to the axis of the confusion accelerator. Its other feature is that the catcher shield is attached to the rack using a strain gauge link. The latter makes it possible to determine the effort with which the flow of cut stem mass interacts with the receiving plane.



a *b*

Fig. 3. Accelerator of cut stem mass:
a – 3D model of the accelerator; b– manufactured laboratory sample

To supply the mass, a belt conveyor 5 (Fig. 2), 2 m long, was used, the drive of which was made by a motor-reducer MP_32-40 with a power of $N_33 = 1.5$ kW through a chain transmission ($Z_1 = 56$; $Z_2 = 56$). Owing to this drive, the conveyor belt with a width of 1 m moves at a speed of 0.195 m/s. A slide was used to direct the mass flow to the receiving mouth of the rotor-drum 1.

The means of controlling the engine is installed in control cabinet 6 (Fig. 2), which is connected by electrical cables to the engines and the network. Cabinet, motors, and subframes are connected to the ground circuit.

The experimental setup was used as follows. A portion of cut corn weighing *m* was placed along the entire width of the conveyor for one linear meter. At the same time, average samples were taken from it to determine moisture content and weighted average cutting length. Accelerator 2 of the cut mass of corn was started, then the rotor-drum 1, the recording equipment (Fig. 2). Last of all, the supply conveyor 5 was started. Knowing that the speed of the conveyor belt is $V = 0.195$ m/c and there is a material of mass *m* on the belt with a length of *l* m, the supply *q* will be [10]:

$$q = \frac{m \cdot V}{l}, \text{kg/s} \tag{1}$$

Taking into account that the speed of the belt was constant, and the mass was placed on 1 m of the belt, the mass supply was determined [10]:

$$q = \frac{m(\text{kg}) \cdot 0{,}195(\text{m/s})}{1(\text{m})} = 0{,}195 \cdot m, \text{kg/s} \tag{2}$$

Through the receiving throat of the casing of the rotor-drum 2, the mass fell onto its blades, which, after acceleration through the vertical discharge deflector, were directed into the accelerator 2. Entering the zone of action of the accelerator blades, which is determined by its dimensions and the angle α between the input and output channels, the mass flow is directed to catcher shield 4, the receiving plane of which is set perpendicular to the flow direction. Having created effort and rebounded from the receiving plane, the cut mass falls to the floor under the catcher shield.

The shield was installed on the support using a strain gauge link. Four strain gauges are pasted on the link, which is connected in a bridge circuit. Using the shield, the effort F created by the mass flow moving at a speed V was recorded. The signal from the strain gauge of the catcher shield was recorded on a personal computer through an analog-to-digital converter.

The specific energy consumption E_s was calculated according to the known dependence:

$$\mathrm{E}_s = \frac{N}{q}, \mathrm{J/kg} \tag{3}$$

where N – power consumed by the accelerator of the cut mass, W; q – mass supply to the feeding drum, kg/s.

To register the power developed by the electric motor, the current consumed by each of the motors was determined. The signal to the ADC was supplied from a current transformer installed in one of the phases of the electric motor. Previously, the current transformers were tared with the K505 complex.

The operation of the accelerator is influenced by both structural and technological factors. Design parameters, for example, overall dimensions, the number of revolutions of the thrower, the number of blades and their location, and the gap at the place of acceleration, characterize the design of the accelerator and are not interconnected with technological ones.

The technological factors on which the process of transportation of the cut mass by the accelerator will directly depend include moisture of the cut stem mass (W, %), the weighted average length of the cut mass (L_l, cm), supply of the cut stem mass (q, kg/s). Although they are predictable, their change in the process is random.

Thus, mass moisture as a result of falling dew, gradual drying of the mass, and different swath capacity can change during the day and location on the field. Mass supply varies depending on the yield variation in the field. Both moisture and supply affect the cutting length of the combine's shredder.

When conducting experimental studies, cut stem mass was the starting material. So, a cut mass of corn stalks was used with an average cutting length of 12 to 24 mm and a moisture content of 54 to 76 %, when stacking it on 1 m of the conveyor, which made it possible to create a feed of 6 to 13 kg/s.

To determine the weight of the cut stem mass, which was placed on 1 meter of the feeder conveyor, several calculations were made and it was determined that the most optimal is the set weight of 33 kg, which provides a feed of 6.4 kg/s.

The main physical and geometrical properties of the cut stem mass were determined according to current methods [11, 12, 13]. The mass fraction of moisture W_{m} of the cut stem mass was calculated as a percentage according to the well-known formula [14]. The weighted average cutting length and mass moisture were determined according to typical methods [15].

Research on the influence of technological factors on the process of mass acceleration was carried out as one-factor experiments with controlled values of other factors. This is due to the fact that obtaining, for example, a fixed value of humidity or cutting length is problematic. These values turn out to be close to the desired ones but differ from the given value. As a result of such experimental studies, it is possible to obtain not only one-factor regression equations but also a mathematical model for all three factors.

The criterion for optimization was the minimum expenditure of specific energy for the acceleration of the cut stem mass E_s (kJ/kg) and the optimal effort on the catcher shield F_{sh} (N).

The number of tests required with a test reliability of 0.95 and an error of ± 3σ was 3 [16]. At the same time, the relative error of the arithmetic mean did not exceed 5 %. The homogeneity of variance was checked according to the Cochrane test [17].

The conducted single-factor experimental studies [69] made it possible to obtain the results of the influence of technological factors on the effort created by the mass on the registration board and the specific energy consumption.

Thus, for the relative humidity of the mass in the range of W = 54-76%, with its increase, the effort F_w and the specific energy consumption E_w decrease, and the dependencies are as follows:

$$F_w = -25{,}106 - 0{,}028W^2 + 2{,}943W, \tag{4}$$

$$E_w = 0{,}478 - 6W^2 - 0{,}005W. \tag{5}$$

The change in effort on the catcher shield and specific energy consumption depending on the change in the relative humidity of the cut stem mass is presented in Figure 4.

An increase in the supply of crushed corn stem mass from 6 kg/s to 13 kg/s leads to both an increase in effort (F_q) from 15 N to 140 N (almost ten times) and an increase in specific energy consumption (E_q), which is described by the following dependencies:

$$F_q = 176{,}244 + 3{,}395q^2 - 47{,}095q, \quad (6)$$

$$E_q = 0{,}272 + 0{,}003q^2 - 0{,}051q. \quad (7)$$

The dependence of the change in the effort on the catcher shield and the specific energy consumption on the supply of the cut stem mass is presented in Figure 5.

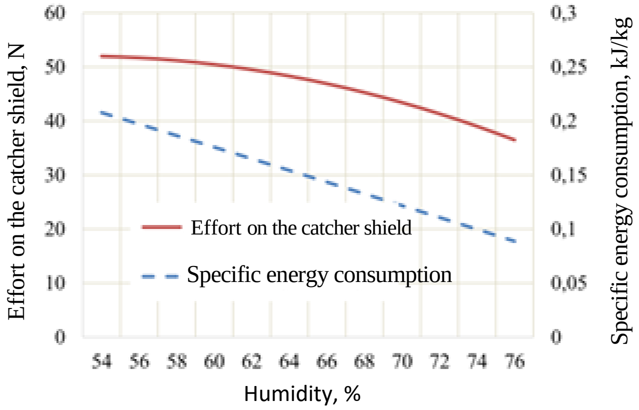


Fig. 4. Graph of the dependence of the effort on the catcher shield and the specific energy consumption on the change in the relative humidity of the cut stem mass

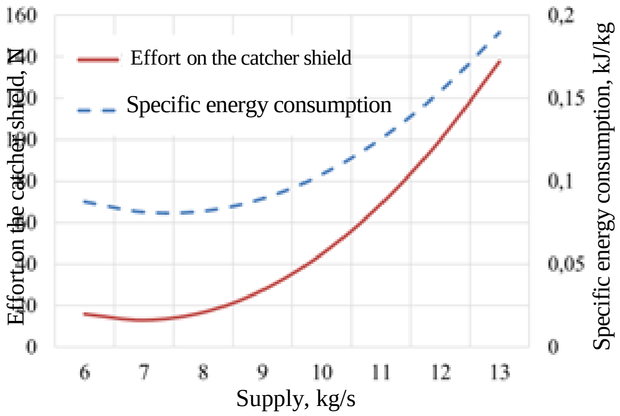


Fig. 5. Graph of the dependence of the effort on the catcher shield and the specific energy consumption on the amount of supply of the cut stem mass

As a result of the regression analysis, the following approximating dependences of the effort change on the catcher shield and specific energy consumption on the weighted average length of the corn mass were obtained

$$F_L = 79{,}732 + 0{,}153L^2 - 5{,}032L, \quad (8)$$

$$E_L = 0{,}056 - 5L^2 + 0{,}005L. \quad (9)$$

Changing the weighted average length of the corn mass (L_a) from 12 to 24 mm first (to 16 mm) reduces the force (F_L), and then increases it to 47 N (Fig. 6).

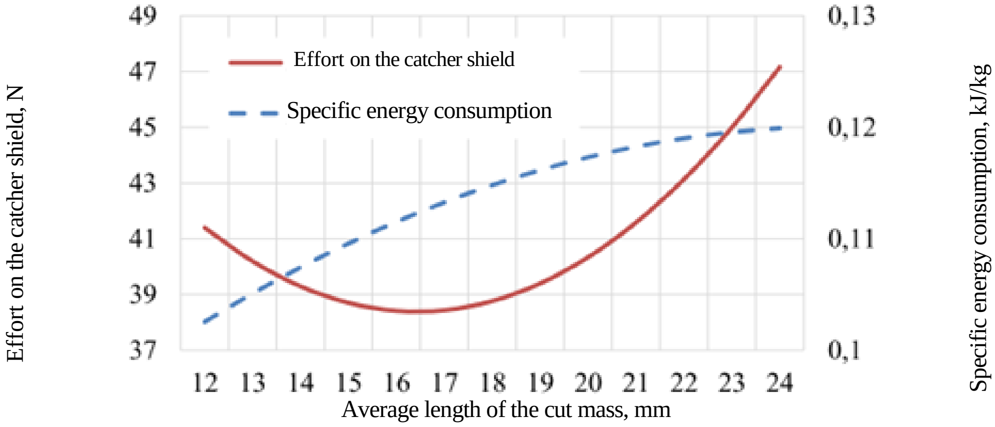


Fig. 6. Graph of the dependence of the effort on the catcher shield and the specific energy consumption on the weighted average length of the cut mass

Also, an experiment was conducted in which the chopped stalk mass accelerator was excluded from the discharge channel, by dismantling the rotor blades of the accelerator and installing a casing plate, which extended the discharge channel and ensured the operation of the discharge channel without the chopped mass accelerator. The graphical dependence of the influence of the feed on the magnitude of the effort on the catcher shield is presented in Figure 7.

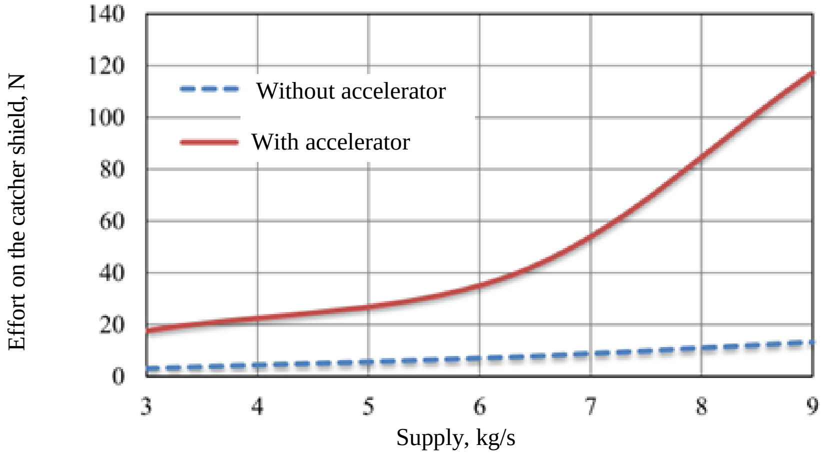


Fig. 7. Graph of the dependence of the effort on the catcher shield on the supply of the cut mass

Analysis of the graphical dependence (Fig. 7) shows that without the use of an accelerator, the increase in feed leads to a uniform increase in effort from 3.11 N to 13 N. The use of an accelerator also monitors the increase in effort on the catcher shield, however, the effective forces are an order of magnitude higher and are monitored with a significant increase for feeds over 6.5 kg/s. This experiment confirms the expediency of using an accelerator in the discharge channel of a forage harvester.

6. Conclusions

1. The developed installation allows to evaluate the impact of technological (design) factors on the energy and quality performance indicators of the accelerator.

2. As a result of the conducted experimental studies, it was established that of the studied technological factors (W, L_a, q) the most significant is the supply of cut stem mass. Thus, an increase in the supply of crushed stalk mass of corn from 6 to 13 kg/s leads to both an increase in effort from 15 to 140 N (almost ten times) and an increase in specific energy consumption from 0.12 to 0.18 kJ/kg. An increase in the moisture content of the stem mass of corn from 54 to 76 % leads to a decrease in the effort on the catcher shield and the specific energy consumption. The minimum values of the specific energy consumption of the accelerator in the range of 0.103-0.105 kJ/kg are achieved with a weighted average stem mass of 14-18 mm. The influence of technological factors on the process of transporting the cut stem mass by the accelerator of the harvester through the discharge channel is parabolic in nature.

3. The use of the accelerator of the cut stem mass leads to an increase in the effort on the catcher shield, which is an order of magnitude higher than without it, and a significant increase is observed at feeds over 6.5 kg/s.

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ВПЛИВ ТЕХНОЛОГІЧНИХ ФАКТОРІВ НА ЕНЕРГЕТИЧНІ ВИТРАТИ РОБОТИ ПРИСКОРЮВАЧА РІЗАНОЇ МАСИ

Кормозбиральні комбайни у сучасному виконанні це потужні машини, які забезпечують заготівлю корму згідно агротехнічних вимог. Вивантажувальний канал у кормозбиральних комбайнах виконано таким чином, що різана маса за найкоротший час потрапляє у транспортний засіб для подальшого перевезення.

Прискорювач у вивантажувальному каналі комбайна забезпечує зручність в експлуатації, дозволяючи вантажити подрібнену масу в транспортний засіб на відстань понад 10 м не лише у транспортні засоби, що рухаються поряд з комбайном, а й позад нього при розкошуванні прокосів. Основною функцією прискорювача різаної маси є надання прискорення та формування компактності потоку різаної маси, після проходження нею доподрібнювальних вальців.

Нині недостатньо досліджено вплив конструктиційно-технологічні параметрів прискорювача різаної маси на процес її вивантаження через канал кормозбирального комбайна, тому, наприклад, обґрунтування технологічних параметрів режиму роботи прискорювача різаної маси вивантажувального каналу кормозбирального комбайну є актуальним.

Об'єктом дослідження був процес транспортування різаної стеблової маси прискорювачем комбайна крізь вивантажувальний канал.

Мета роботи полягала у в експериментальному встановленні впливу технологічних факторів процесу транспортування прискорювачем різаної маси комбайна на витрату питомої енергії та створення зусилля на щитоуловлювачі.

Завданням роботи передбачалось: вивчити стан питання використання прискорювачів різаної стеблової маси у вивантажувальному каналі кормозбиральних комбайнів та їх конструкційне виконання; здійснити аналіз досліджень і публікацій щодо кидання (прискорення) різаної стеблової маси; розробити методику експериментальних досліджень та встановити вплив технологічних факторів процесу транспортування прискорювачем різаної стеблової маси комбайна на витрату питомої енергії та створення зусилля на щитоуловлювачі.

Методи дослідження проводилися експериментально шляхом визначення витрат питомої енергії прискорювача, зусилля, що створювалось на щиті-уловлювачі та подачі різаної стеблової

маси. Обробка експериментальних даних виконувалась з використанням методів регресійного аналізу та математичної статистики.

В результаті проведених експериментальних досліджень було встановлено, що з досліджуваних технологічних факторів (W, L_{cp}, q) найбільш суттєвим є величина подачі різаної стеблової маси. Збільшення подачі подрібненої стеблової маси кукурудзи з 6 до 13 кг/с призводить як до збільшення зусилля з 15 до 140 Н (майже в десять разів) так і збільшення питомих енерговитрат від 0,12 до 0,18 кДж/кг. Збільшення вологості стеблової маси кукурудзи з 54 до 76 % призводить як до зменшення зусилля на щиті-уловлювачі так і питомої витрати енергії. Мінімальні значення питомої витрати енергії прискорювача в межах 0,103-0,105 кДж/кг досягали при середньозваженій стебловій маси 14-18 мм. Вплив технологічних факторів на процес транспортування різаної стеблової маси прискорювачем комбайна крізь вивантажувальний канал носить параболічний характер.

Використання прискорювача різаної стеблової маси призводить до збільшення зусилля на щиті-уловлювачі, що на порядок вищі, а ніж без нього, та відслідковується суттєве збільшення за подачі понад 6,5 кг/с.

Ключові слова: *комбайн кормозбиральний, прискорювач, питомі енерговитрати, зусилля, щит-уловлювач, прискорення, подача, різана стеблова маса, технологічні фактори.*

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