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To improve the quality of grain cleaners cleaning machines

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Abstract

The article analyzes the performance and efficiency of the grain cleaning machines, S.Seifullin Kazakh Agro Technical University of technical mechanics department designed based on the design of the complex movement of grain cleaning machine. As a result of the design, in particular through the introduction of planetary bodies in motion, the editor of wheat grain quality cleaning machines.

Key words: wheat, grain cleaning, grain cleaning machines, and further movement towards planetary motion.

Introduction

President of the Republic of Kazakhstan, "Kazakhstan-2030" strategic program, high-quality and environmentally sound is intended to ensure the safety of food products.

To provide high-quality food in the country is the key to solving the problem of grain yield losses in a timely manner to improve the collection, storage costs and develop a rational and effective use [1].

In order to get a high result it is necessary to do processing of the grain. The processing include cleaning, sorting and calibration. Grain cleaning is a separation of debris from impurities and offer grass. The main purpose of the sorting of high-quality seeds and the distribution of seeds, depending on the characteristics of the sample. Calibration is the distribution of seeds of different fractions. It is only within a certain size fraction. Corn, sugar beet and sunflower seeds etc. calibrate the crops [2].

Before cleaning grain crops it is in necessary to find out debris in the main mass. Corn and a mixture of the three main dimensions: width, length and thickness. Sifted through the same holes in the grain mixture, sizes, small grains pass through the hole, and will remain on the older ones. For the use of the properties of this size, the dimensions of the hole in the grain processing machines equipped with various members. This is not only the size of the hole in the sieves, their shapes may vary. For example, the width of a grain processing for the round, and the thickness of the elongated hole sieves are used for processing [3].

To justify the construction of the grain cleaning machine.

Grain-cleaning machines is a key member of the working sieves device. Currently, most of the grain cleaning machines used in the industry, in order to ensure the movement of wheat of one of the inclination of the sieve of one of the devices installed. This further movement towards the top of the sieve move grain out of the sieve openings, impurities is removed. [4].

However, the forward motion of the leading grain-cleaning machines and education and sieves box loads of character variable loads. This particles leads to more rapid degradation of the material and energy costs. At the same time, the editor of wheat caused by the movement of the machine after advanced variable-digit decreases the reliability of its work force. [5].

The shortcomings of the grain cleaning machines, replacing it with a sieve after the incremental movement of planetary motion, and can be removed. At the same time, the scoops difficult to improve the reliability of their work by members of the movement, can reduce material costs [6].

For this purpose, S.Seifullin Kazakh Agro Technical University developed at the Department of Mechanics, a complex movement of grain cleaning machine diagram is shown in Figure 1.

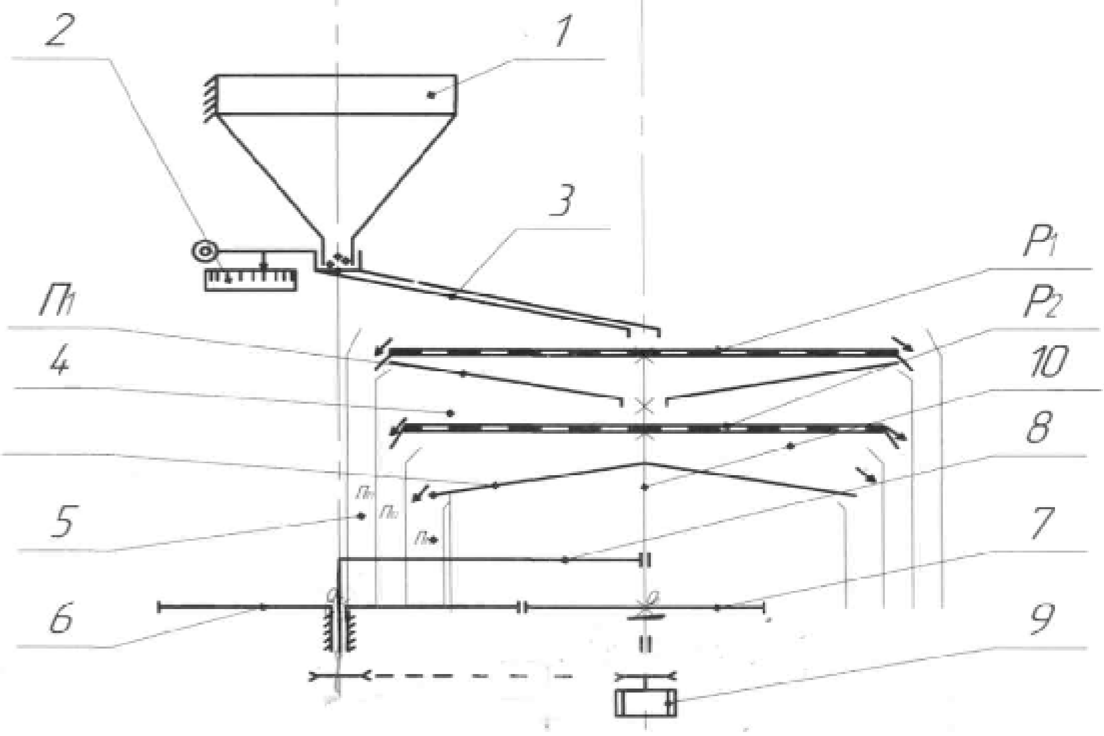


Figure 1. Complex movement of grain cleaning machine

Complex movement of grain cleaning machine consists of the following components: The housing consists of 2 out of the freezer and 3 goals 1; P1 and P2 in the bottom of the sieve set consisting of 4; cylinder pipelines P1, P2, P3 system with 5, and leading. Electric vehicles moving through the drive 9 days tong 6, 7 and 8 Explore. Washer and sieves spare set of the body 10 rigidly fixed to the axis.

Challenging position in the movement of grain cleaning machine are as follows: Electric vehicles make efforts Explorer 8 and 9 in a circular motion. Explorer 7, moving around a fixed day of the tongs 6osi 0.

Defender of wheat during the 2 1 screw and rotating the upper body to the loader scoops P1During this time, the light weight and large seeds and other crops flakes and other objects along the cylinder tube Q1 comes out, the rest of the wheat will be lower scoops P2. This is not less than the shape of the grains in the cylinder pipe runs P3, clean grains are cleaned cylinder pipe P2. [7]

Rationale for the movement of grain cleaning machine colander complex graphics

The proposed complex movement of grain cleaning machine colander in older to study the patterns of movement of wheat from the top of the point in time considered liner curve radius and angle of rotation.

The trajectory of the movement of the sieve above the wheat can be justified by the trajectory of his own. Theoretical studies have shown that the shape of the trajectory Archimedes [3]. Over a sieve to clarify its graphical and analytical methods can detect the movement of wheat.

Moving to the middle of the Cartesian system of sieves and sieve the wheat on the surface of B (x, y) point to consider:

$$\rho = \sqrt{x^2 + y^2}; \tag{1}$$

This

$$x = \rho \cos \varphi ; \; y = \rho \cos \varphi . \tag{2}$$

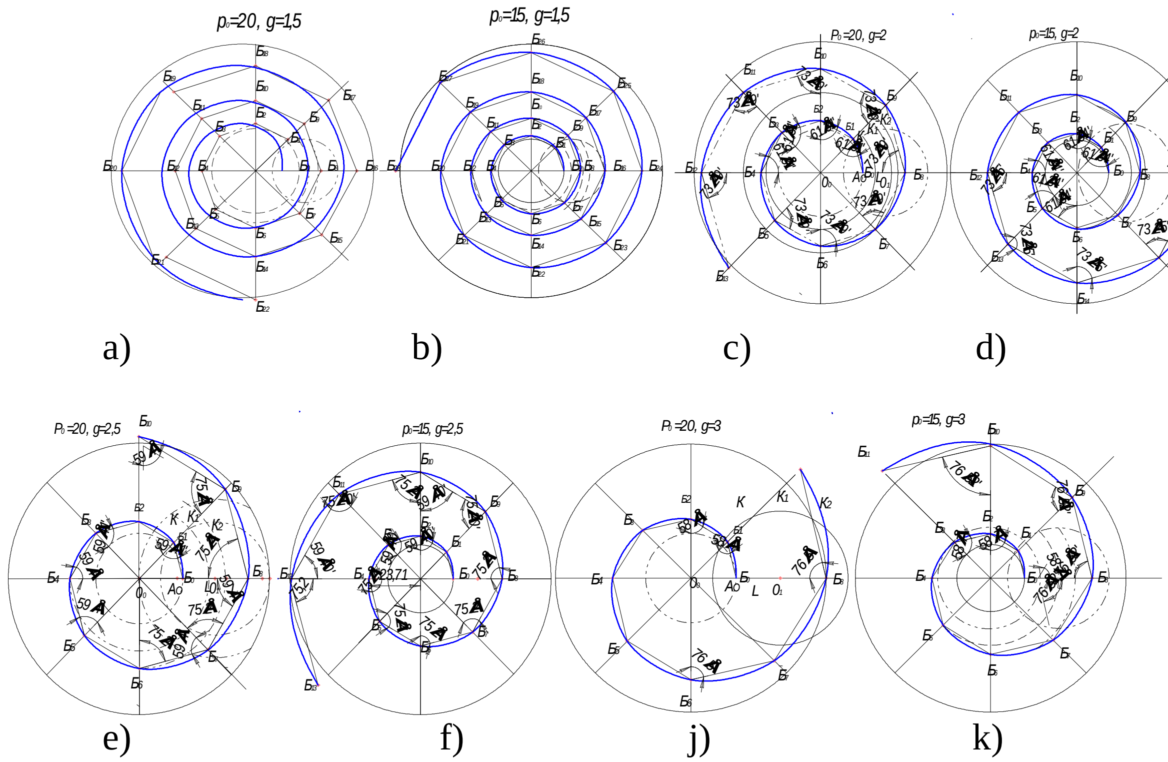
Use the spirals found in nature. The idea is that the logarithm of the turning radius of the point of sliding movement to increase the stability of the component. Pay a sieve into the range of 8, and the first from the surface of the sieve wheat find any point of the trajectory of Figure 2.

Point to the center of scoops wheat ρ_o mark, next $OA_1 = g\,OA_0$ build a framework for. Here g – logarithmic growth rate. So to ρ and Explore

ωt the angle of rotation $\eta = \frac{1}{2}; \eta = \frac{1}{3}; \eta = \frac{1}{1,5}; \eta = \frac{1}{4}; \eta = \frac{1}{2,5}.$

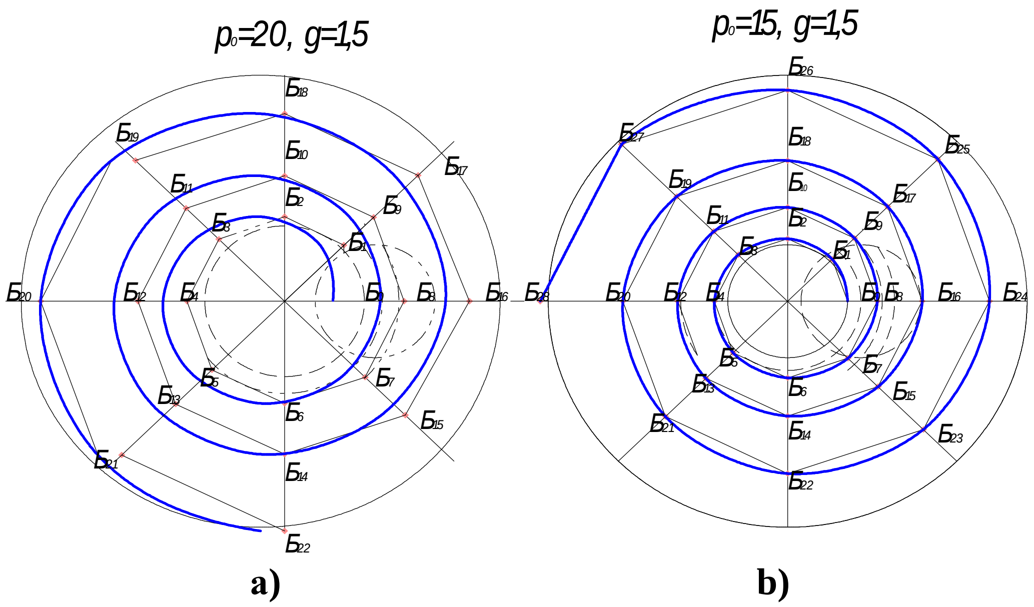
relations 8

Version.



2 - Several versions of the image at the top of the sieve movement of wheat

The movement of wheat in a sieve above the eight options are reviewed and stored in a sieve over a lot of wheat was chosen the best option. It is shown in Figure 3. These versions $\rho = 20{,}15;\ g = 1{,}5$



3 version of the best motion picture at the top of the scoops of wheat

3 show a graphical way in the top of the sieve wheat version of the day pliers and sub-optimal movement $\eta = \frac{1}{3}$ depending on the ratio. The calculations in this version of the

legend of the polar coordinates graph shown in Figure 4. Here, the movement of wheat in blue and red color to its starting point.

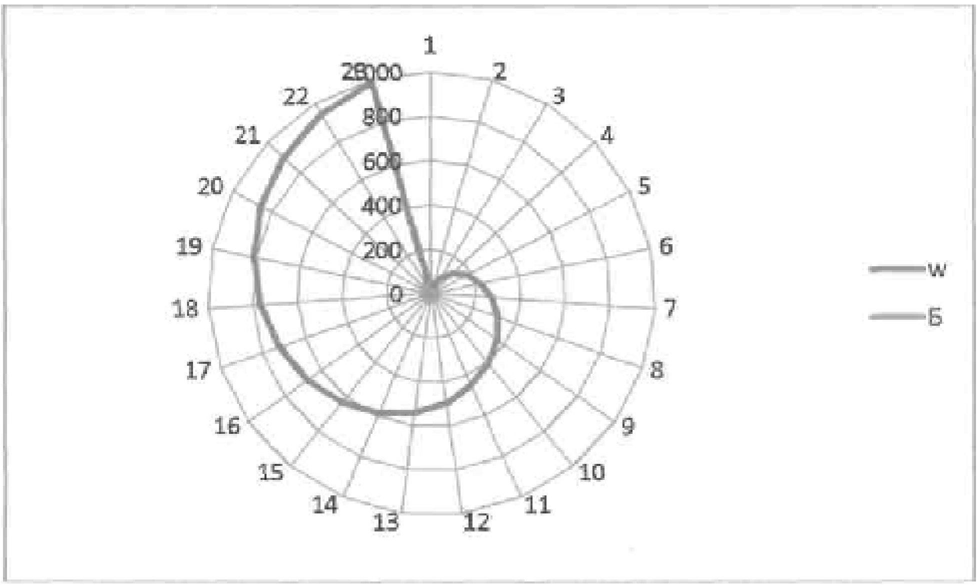


Figure 4 scoops of wheat on the version of the schedule of calculations in polar coordinates the movement of a mobile version of the legend

Draws see movement on the sieve wheat spiral path in the graph. It will increase the wheat sieve to settle more on the cleaning ratio.

Obtained by the movement of wheat in a sieve above the graphic versions of the analytical method, the numerical values of the parameters can be determined.

The movement of grain cleaning machine colander complex analytical justification:

To consider the theoretical calculations to appoint them through the numbers, that is, r_o when the 20mm and 15mm g= 3; 2,5; 2; 1,5 dependencies. To do this, use the following formulas:

$$\rho = \rho_0 \cdot e^{k\varphi}; \qquad (3)$$

$$k = \frac{\ln g}{2\pi}; \qquad (4)$$

Dependence on wheat to the entry point of the logarithmic equation presented in tables 1 and 2, where values of g equal to the 3; 2,5; 1,5 .

Table 1, entry point of the logarithmic dependence of wheat

	k	ω	$k\varphi$		k	ω	$k\varphi$
$Б_1$	$\ln(3)\|2\pi$	$\frac{\pi}{4}$	0,14	$Б_{12}$	$\ln(2)\|2\pi$	3	1,04
$Б_2$	$\ln(3)\|2\pi$	$\frac{\pi}{2}$	0,27	$Б_{13}$	$\ln(2)\|2\pi$	13	1,13
$Б_3$	$\ln(3)\|2\pi$	3	0,41	$Б_1$	$\ln(1{,}5)\|2\pi$	$\frac{\pi}{4}$	0,05
$Б_4$	$\ln(3)\|2\pi$	π	0,55	$Б_2$	$\ln(1{,}5)\|2\pi$	$\frac{\pi}{2}$	0,1
$Б_5$	$\ln(3)\|2\pi$	5	0,69	$Б_3$	$\ln(1{,}5)\|2\pi$	3	0,15
$Б_6$	$\ln(3)\|2\pi$	3	0,82	$Б_4$	$\ln(1{,}5)\|2\pi$	π	0,2
$Б_7$	$\ln(3)\|2\pi$	7	0,96	$Б_5$	$\ln(1{,}5)\|2\pi$	5	0,25
$Б_8$	$\ln(3)\|2\pi$	2π	1,1	$Б_6$	$\ln(1{,}5)\|2\pi$	3	0,3
$Б_9$	$\ln(3)\|2\pi$	9	1,24	$Б_7$	$\ln(1{,}5)\|2\pi$	7	0,35
$Б_1$	$\ln(2{,}5)\|2\pi$	$\frac{\pi}{4}$	0,11	$Б_8$	$\ln(1{,}5)\|2\pi$	2π	0,41
$Б_2$	$\ln(2{,}5)\|2\pi$	$\frac{\pi}{2}$	0,23	$Б_9$	$\ln(1{,}5)\|2\pi$	9	0,46
$Б_3$	$\ln(2{,}5)\|2\pi$	3	0,34	$Б_{10}$	$\ln(1{,}5)\|2\pi$	5	0,51
$Б_4$	$\ln(2{,}5)\|2\pi$	π	0,46	$Б_{11}$	$\ln(1{,}5)\|2\pi$	11	0,56
$Б_5$	$\ln(2{,}5)\|2\pi$	5	0,57	$Б_{12}$	$\ln(1{,}5)\|2\pi$	3	0,61
$Б_6$	$\ln(2{,}5)\|2\pi$	3	0,69	$Б_{13}$	$\ln(1{,}5)\|2\pi$	13	0,66
$Б_7$	$\ln(2{,}5)\|2\pi$	7	0,8	$Б_{14}$	$\ln(1{,}5)\|2\pi$	7	0,71
$Б_8$	$\ln(2{,}5)\|2\pi$	2π	0,92	$Б_{15}$	$\ln(1{,}5)\|2\pi$	15	0,76
$Б_9$	$\ln(2{,}5)\|2\pi$	9	1,03	$Б_{16}$	$\ln(1{,}5)\|2\pi$	2	0,81
$Б_{10}$	$\ln(2{,}5)\|2\pi$		1,15	$Б_{17}$	$\ln(1{,}5)\|2\pi$	17	0,86
$Б_1$	$\ln(2)\|2\pi$	$\frac{\pi}{4}$	0,09	$Б_{18}$	$\ln(1{,}5)\|2\pi$	9	0,91
$Б_2$	$\ln(2)\|2\pi$	$\frac{\pi}{2}$	0,17	$Б_{19}$	$\ln(1{,}5)\|2\pi$	19	0,96
$Б_3$	$\ln(2)\|2\pi$	3	0,26	$Б_{20}$	$\ln(1{,}5)\|2\pi$	5	1,01
$Б_4$	$\ln(2)\|2\pi$	π	0,35	$Б_{21}$	$\ln(1{,}5)\|2\pi$	21	1,06
$Б_5$	$\ln(2)\|2\pi$	5	0,43	$Б_{22}$	$\ln(1{,}5)\|2\pi$	11	1,12

Б6	$\ln [(2)\|2\pi]$	3	0,52	Б23	$\ln [(1,5)\|2\pi]$	23	1,17
Б7	$\ln [(2)\|2\pi]$	7	0,61	Б24	$\ln [(1,5)\|2\pi]$	3	1,22

The following logarithmic tables and the angular dependence with respect to the frequency of the graphics will be drawn.

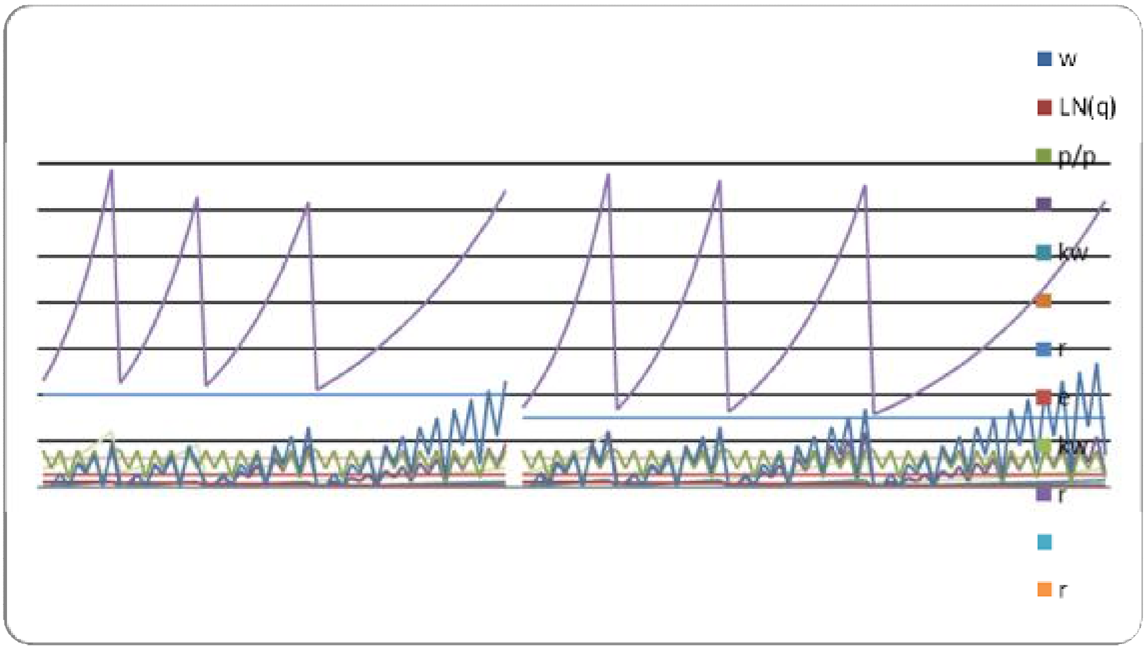


Figure 5 shows a logarithmic graph of the movement of wheat

The angular dependence of the speed of rotation of the drive of the movement of wheat, obtained by a logarithmic equation schedule (Figure 5), that the movement of the point of incidence of the two types of wheat and wheat anywhere in the top of the sieve trying to make logarithmic change the trajectory of the fall line. The stability of the speed of the movement of wheat and will be forced to make sure that the circular. W marked curvature of zero (vortex) velocity curves wheat, and below the zero line on the logarithmic proof has shifted to the large seeds of the lines outgoing traffic.

The results of the study

The complex movement of the grain cleaning machines and technology in order to select the optimal sieve analytical grave analyzed the movement of the surface of the grain.

Crops entry point angular frequency calculated by the formula:

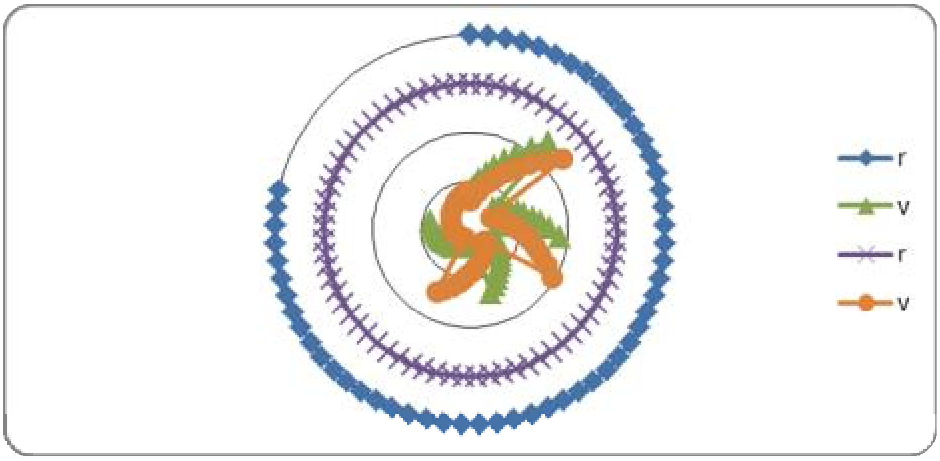
$$\frac{d\rho}{d\varphi} = \frac{d}{d\varphi}\left(\rho_0 e^{k\varphi}\right) = \rho_0 d\left(e^{k\varphi}\right) = k\rho_0 e^{k\varphi} = \mathbf{kr} \quad (5)$$

The calculation results are shown in Table 3

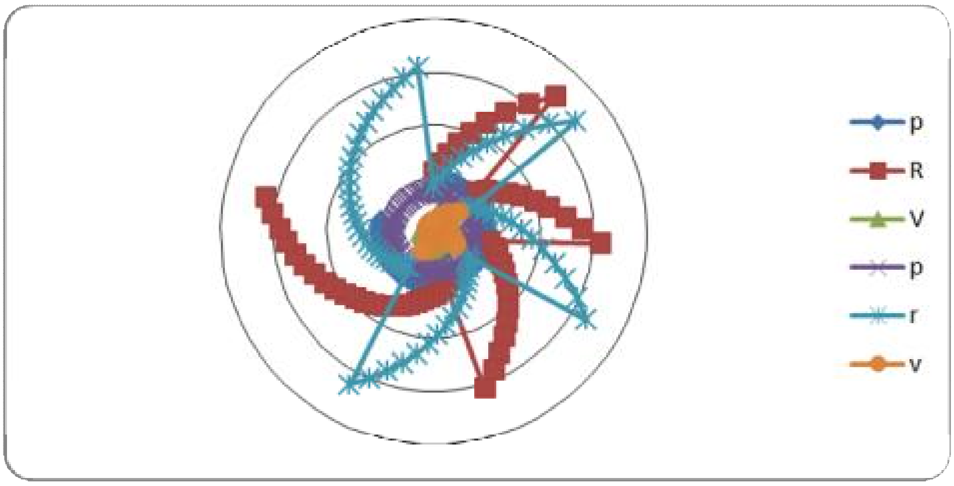
Table 3 radius of the location and speed of the point of entry of wheat

	$\ln(g)$	ρ	r	ϑ		ρ	r	ϑ
$Б_1$	1.098612	20	22,93	4,01	$Б_4$	15	25,97	4,54
$Б_2$	1.098612	20	2,30	4,60	$Б_5$	15	29,78	5,21
$Б_3$	1.098612	20	30,19	5,28	$Б_6$	15	34,15	5,97
$Б_4$	1.098612	20	34,63	6,06	$Б_7$	15	39,21	6,86
$Б_5$	1.098612	20	39,71	6,95	$Б_8$	15	44,96	7,86
$Б_6$	1.098612	20	45,54	7,96	$Б_9$	15	51,57	9,02
$Б_7$	1.098612	20	52,28	9,14	$Б_1$	15	59,20	10,36
$Б_8$	1.098612	20	59,95	10,48	$Б_2$	15	67,89	11,87
$Б_9$	1.098612	20	68,76	12,03	$Б_3$	15	16,81	2,45
$Б_1$	0.916291	20	22,41	3,26	$Б_4$	15	18,86	2,75
$Б_2$	0.916291	20	25,15	3,67	$Б_5$	15	21,14	3,08
$Б_3$	0.916291	20	28,18	4,11	$Б_6$	15	23,71	3,45
$Б_4$	0.916291	20	31,62	5,17	$Б_7$	15	26,60	3,88
$Б_5$	0.916291	20	35,47	5,17	$Б_8$	15	29,81	4,35
$Б_6$	0.916291	20	39,75	5,79	$Б_9$	15	33,45	4,88
$Б_7$	0.916291	20	44,6	6,50	$Б_{10}$	15	37,48	5,47
$Б_8$	0.916291	20	49,98	7,29	$Б_1$	15	42,05	6,13

Graphical method to sieve wheat on the spiral movement is confirmed by the values obtained from the radius of the point of the analyst estimates. And the following graphs drawing table.



Radius of the point of entry and speed 1



Radius of the point of entry and speed 2

Figure 7 - Crops the results of the calculations of the frequency of the entrance point of the corner

Conclusion

As a result of the proposed complex movement of grain cleaning machine based on the theoretical equations of the first movement of the sieve above the wheat from the logarithmic spiral grave analytical analysis, wheat proved to be a spiral trajectory. Explorer and wheat on the basis of the equation are optimal variants of the movement over a sieve. That is, the ratio of the planetary transmission charts and graphs and analytical methods. This draws movement over a sieve wheat spiral path. It will increase the wheat sieve to settle more on the cleaning ratio.

References

1.Nazarbayev NA "Kazakhstan-2050" Strategy of the new policy. The President of the Republic of Kazakhstan Nazarbayev's Address to the Nation. Almaty: "Kazakh encyclopedia", 2013. - 56 p.

2.Tarasenko AP Modern machines after collecting Monitor beans and seeds M Colossus, 2008. - 232s.

3. Kapov SN, SD Shepelev Improving the efficiency of collecting seeds. Their Work. Achievements of Science and equipment, APC. 2010. №12.S. 76-78.

4. Kapov SN, SD Shepelev Structured analysis technologies build grain cultures. / Bulletin of the ÇGAA. 2010. T.56. S.98-102.

5. Eskhozhin DZ, Bayshugulova Sh.K. Grain-cleaning machine with a complex movement of the working body / Collection of scientific articles on materials of the XI International scientific-practical conference dedicated to the 65th anniversary of the Faculty of Agricultural Mechanization "Actual problems of scientific and technological progress in agriculture". Stavropol. 2015. S.14-18.

6. Eskhozhin DZ, Nukeshev SO, Bayshugulova Sh.K., ES Akhmetov Improving the efficiency of grain cleaning and sorting machines. / Innovation Convention "Kuzbass: education, science and innovation." T2. 2013. S.32-37.

7. Innovation patent KZ № 79444, zernoochistitelnaja car with a complex movement of the working body / Bayshugulova Sh.K., Eskhozhin DZ, Nukeshov SO, ES Akhmetov, Ualieva AZ Reported // 02.28.2013, publ.

8. Bayshugulova Sh.K., Eskhozhin DZ, ES Akhmetov, Ualieva AZ Analysis of existing technical solutions winnowing machines / Proceedings of the international scientific-practical conference dedicated to the 100th anniversary of the outstanding scientist, agrarian economist Professor MA Gendelman "Innovation - the way to a new stage of development of agrarian and industrial complex." 2013 T 3. S.14-16.

9. Bijsystems Engineering, Volume 101, Issue 1, September 2008, Pages 42-49 Geert Craessatrts, WouterSaeys, Bart Missotten, Josse De Baerdemaeker.

10. Bayshugulova SK Planetary sieve difficult to justify the movement. / S. For the 120th anniversary of the Seifulin "Seyfullin reading of 10 industrial and innovation policy in building a competitive training and the role of science in the future," .T1, Part 1. 2014. S. 29-31.

Резюме

Объектом исследования является разработка и обоснование параметров зерноочистительной машины, и технологический процесс очистки зерна.

Предметом исследований являются закономерности влияния конструктивных и технологических параметров зерноочистительной машины со сложным движением рабочего органа на качество послеуборочной обработки зерна. В статье описаны спиралеобразное движение зерна, обеспечивающие долготу нахождения зерна на решете. Результаты аналитических и графических методов исследования движение зерна дают положительные показатели, обеспечивающие улучшения очисти зернового материала

Түйін

Мақалада күрделі қозғалысты астық тазалаушы машина теориялық негізделіп, нәтижесінде алғаш рет алынған елеуіш үстіндегі бидай қозғалысының теңдеуі графо-аналитикалық түрде талданып, бидай траекториясы спираль болатыны дәлелденді. Теңдеудің негізінде жетектегіш пен қосақтың және бидайдың елеуіш үстіндегі қозғалысының оңтайлы нұсқалары анықталды. Яғни планетарлық берілістің тиімді қатынасы графика-аналитикалық әдістермен табылды.Талдау графиктері мен есептеу көрсеткіштері көрсеткендей бидайдың елеуіш үстіндегі қозғалысы спиральды траекторияны сызады. Ол бидайдың елеуіш үстінде көбірек тұрақтап тазалану коэфициентін арттыратынын көрсетеді.

Summary

The return and translation alma vermin grates of grain cleaner machines create the mark variable loads, that is the reason of the low safety work. The grate with planetary movement is offered, which avoid the mentioned defects. The

differential equation has been solved. Its solution allows to set the movement of grain in logarithmic spiral.

As a result of the proposed complex movement of grain cleaning machine based on the theoretical equations of the first movement of the sieve above the wheat from the logarithmic spiral graft analytical analysis, wheat proved to be a spiral trajectory. Explorer and wheat on the basis of the equation are optimal variants of the movement over a sieve. That is, the ratio of the planetary transmission charts and graphs and analytical methods. This draws movement over a sieve wheat spiral path. It will increase the wheat sieve to settle more on the cleaning ratio.