ISSN 2181-8622

Manufacturing technology problems

Scientific and Technical Journal Namangan Institute of Engineering and Technology

NAMANGAN MUXANDISLIK-TEXNOLOGIYA INSTITUTI

INDEX COPERNICUS INTERNATIONAL

Google Scholar

Crossref doi

SLIB.UZ Scientific library of Uzbekistan

Volume 10
Issue 1
2025

UDC 631.3

ANALYSIS OF THE INDICATORS OF THE AVERAGE SPEED OF UNITS FOR THE PROCESS OF LOADING INTO A POTATO HARVESTING MACHINE

BAYBOBOEV NABIZHAN

Professor, Namangan Engineering-Construction Institute, Namangan, Uzbekistan
Phone.: (0897) 594-5770, E-mail.: ngbayboboev@gmail.com
ORCID: 0000-0001-8681-0052

MUMINOV AZAM

Senior lecturer, Namangan Engineering-Construction Institute, Namangan, Uzbekistan
Phone.: (0893) 941-7020, E-mail.: azamsher1983@gmail.com
ORCID: 0009-0007-6946-2085
*Corresponding author

Abstract: This paper examines the study of stationarity at different values of aggregate velocity during the transfer of lump mass and soil mixture and provides general conclusions.

Keywords: potato digger, digger, design, sifter, harrow, mathematical expectation, dispersion, standard deviation, distribution polygon, histogram, distribution density.

Introduction. The results of many years of operation of potato diggers led to the collection of important data on the average value of transmission, physical and mechanical properties of the nodule mass and its fractional composition. At the same time, this helped to provide information on the possibility of changing the average values in different soil and climatic conditions. In this regard, the main task of not only filling the studied data, but also their operation under normal conditions is studied, mainly on establishing standards for changing the load of two-row potato harvesters. In some cases, where possible, not only work processes are considered, but also issues that lead to the formation of their change. In this paper, information on the dynamics of the loading process, which was not previously realized, is studied.

The transfer value of the knotty layer in a potato digger can be calculated using the following expression:

$$Q_n = F_n \cdot V_k \cdot \gamma_n \cdot \Delta t \quad (1)$$

Here: γ_n - do not interfere significant mass

F_n - The working part of the machine has been dug out cross-section of soil mixture q;

V_k - unit speed;

Δt - wasted time.

From this expression it can be determined that the volume of transfer depends on the following factors: the cross-sectional surface of the extracted layer of concretions and, consequently, the shape and structure of the field , the error in the operation of the transmitting device, the bulk density of the conventional masses, etc. [1,2]. This depends on the dimensions and serviceability of the working part of the machine with the mass-exchange end [3,4]. The ordinates of this process have a normal distribution density until a multiplicity of homogeneous problems of approximation of the degree arises to determine the change in the magnitude of the final mass transfer. This is why the process must be non-differentiable [5]. These results fully confirm the results of statistical studies on the implementation of conventional mass transfer. Statistical analysis of the following processes is mainly carried out in the following order: checking for stationarity and ergodicity, analyzing the randomness of the process and, finally, studying the dynamics of the process within the framework of correlation analysis. Tables 1, 2 and 3 show the check of the stationarity of the results of 30 implementations of nodal mass transfer. The results of the research were obtained as a result of the implementation of the MTZ-50 tractor at 1, 2 and 3 speeds. It is known from the table that the mathematical expectation and their dispersions D of the implementation parts m deviate from the mathematical expectation due to randomness. Random deviations of the mathematical expectation and dispersion are presented in each table. The probability value of at least 0.95 is accepted as a reliability hypothesis.

According to the table, obtained using constant centimeter units of plows, the statistical characteristics of which are presented in Figure 5. 22 ± 1But the distance from the potato bush to the top is from 8 cm to 16-18 cm. In this case, the value of the mathematical expectation of the terminal mass transfer changes. And the dispersion remains unchanged. This situation is explained by the following: uneven distribution of gears, different shapes of rows, dynamics of the movement of units, etc. As a result of the deep bearing, the average soil transfer is equal to the following value

$$\Delta h \cdot B \cdot \gamma \cdot \Delta t$$

where: Δh – change in depth during Lemex movement;

V – width of the excavated layer.

The statistical characteristics of the transmission when the plow moves at different depths can be easily determined using the dispersion, which is insensitive to the changing thickness of the seeded layer and does not change. Δh In addition, the above considerations allow us to express the concept of partial ergodicity of the process. The ergodicity of the process of transfer of the lemex motion at different depths is presented in Tables 1, 2 and 3.

Table 1. Analysing the stationarity of the nodal mass transfer bus when a potato harvester is moving at a speed of 0.53 m/s.

No	50 values of the size observation interval						All observations	
Observations	m	D	m	D	m	D	m	D
1.	32.9	27.7	32.6	28.1	32.8	27.8	32.76	27.86
2.	34.1	28.2	33.1	30.2	34.1	29.8	33.75	29.4
3.	32.8	29.1	33.7	28.9	33.5	28.7	33,33	29.2
4.	33.3	28.6	33.6	28.5	33.2	28.4	33.4	28.5
5.	43.4	29.2	33.9	29	34.9	29.9	24.4	29.36

6.	35	29.9	34.2	30.8	34	31.3	34.4	30.66
7.	33	28.7	32.8	29.6	34.1	29.6	30.73	29.3
8.	32.7	28.1	30.1	29.9	33.9	31.8	32.23	29.9
9.	33.5	28.8	33.8	28.7	33.5	27.7	33.6	28.4
10.	32.8	29.9	31.3	30.6	32.6	32.5	32.23	31
$\frac{1}{10}\Sigma$							32.8	29.01

m confidence intervals

for all $\pm 0,62$ parts selection options $\pm 1,5$.

Table 2. Testing the stationarity of nodal mass transfer during the movement of a potato harvester at a speed of 0.64 m/s.

No	**50 values of the size observation interval**						**All observations**	
Observations	m	D	m	D	m	D	m	D
1.	41 , 48	43.51	38.92	40.75	42,54	39.15	41.09	41.13
2.	41.92	41.83	40.34	43.24	42.61	40.7	41,62	41.92
3.	41.34	40.6	37.65	42.15	42.83	42.68	40.6	41.81
4.	42.10	42.75	40,43	41.87	42.7	39.72	41.74	41,44
5.	40.5	44.32	43.9	42.64	42.75	40.6	42.38	42,44
6.	44.96	40.74	40.4	40.38	41.95	42.96	42,43	41.36
7.	42.84	40.54	43.84	45.26	41.65	46.32	42.77	44.04
8.	39.11	40.54	40.31	42.11	40.1	42.25	39.81	41.63
9.	42.5	42.65	42,62	39.12	42.36	40.7	42,49	40.82
10.	40.01	43	43.7	36.25	42.74	42.5	42.15	40.58
$\frac{1}{10}\Sigma$	41.7		41.21		42.19		41.7	41.76

m for confidence intervals

for all ± 1 parts selection options $\pm 1,7$.

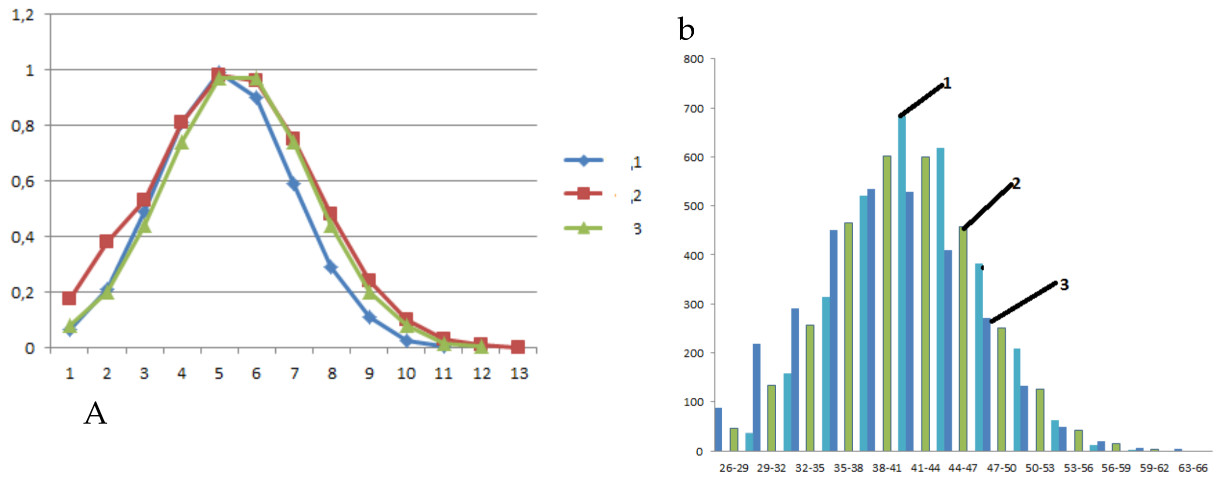
Table 3. Testing the stationarity of nodal mass transfer during the movement of a potato harvester at a speed of 0.78 m/s.

No	**50 values of the size observation interval**						**All observations**	
Observations	m	D	m	D	m	D	m	D
1.	48.3	57.3	51.2	58.1	49.4	58	49.63	57.8
2.	48.4	60	48.7	59.4	49.3	60.6	48.8	60
3.	51.2	62.1	50.6	59.7	51.6	57.6	51.13	59.8
4.	49.6	58.4	49.4	59.2	58.1	58.7	52.36	58.76
5.	51.8	59	48.8	62.4	49.1	62.3	49.3	61.23
6.	51.4	60.1	51.3	60.3	48	60.4	50.23	60.27
7.	49.2	68.7	48.2	58.7	60.1	59	49.16	62.5
8.	48.7	60.3	53.4	59.6	51.5	60.4	52.6	60.03
9.	49.6	59.7	50.6	60.2	48.3	61.8	49.5	60,66
10.	49.9	59.4	49.6	60.2	51.3	60.8	50.46	60.13
$\frac{1}{10}\Sigma$							50.32	60.1

m confidence intervals
for all $\pm 1{,}1$parts selection options $\pm 1{,}8$.

To conclude about the ergodicity and stationarity of the transfer process, it should be noted that the introduced soil transfer process is considered impossible for clay soils with a relative humidity above 23-25%, at which the tractor wheels rotate. During the aggregation of a potato harvester, dirt sticks to the ploughshares. The stationarity of the process is disrupted due to a sudden imbalance or large vibration.

Results. When checking the randomness of stationary processes, the emergence of periodic or quasi-periodic processes is carried out [6]. In an experiment with a periodic process, obtaining an accessible ω_i frequency result with precise reliability depends on the spectral density of the experiment. In this case, the dispersion interval should be with a large difference in the observed frequencies [2] . The frequency range of interest to us 0–3 Hz is not observed when observing fixed changes.



Drawing
Graphs and diagrams 1, 2 and 3 in diagrams a, b show
$V_1 = 0.53$ m/s , $V_2 = 0.64$ m/s and $V_3 = 0.78$ m / s

It is assumed that the ground transmission is a random variable (r.m.) with a normal distribution of the type approximated by its experimental histogram.

$$f\left(Q_n\right) = \frac{1}{\sqrt{2\pi}\sigma\left(Q_n\right)} e^{-\frac{\left(Q_n - \bar{Q}_n\right)^2}{2\sigma^2\left(Q_n\right)}} \qquad (2)$$

where, is $\bar{Q}_n$ the mathematical expectation of the transfer amount;
$\sigma\left(Q_n\right)$- Q_n i.e. standard deviation.

Conclusions. From the above analysis it is seen that every 10 experimental results in the observed process are considered as an exact indicator of one population, and the result of transmitting 10 observations can be used to construct a histogram of the distribution density. Experimental examples and histograms of their distribution density are constructed based on the experimental results of random variables presented in the diagram a, b - for the 1st, 2nd and 3rd nominal speeds of the unit. In all three cases, the stationarity of the process is sufficient, and it can be seen that the distribution obeys the normal law. Due to the fact that the second and third nominal speeds have almost the same polygon, it can be assumed that the theoretical speed varies within V_1 and V_2.

Reference

1. Baiboboev , A. N., Kodirov , S. T., Akbarov, Sh. B., Goipov , Yu. G. Khamzaev , A. A. Calculation of the technological process of soil separation with a loosening drum // An integrated approach to scientific and technical support of agriculture. - 2019. - P. 60-64.

2. N.G. Baiboboev , Yu.G. Goyipov , A.Kh. Khamzaev , S.B. Akbarov, and A.A. Tursunov, "Justification and calculation of gaps of separating working bodies of tuber cleaning machines", in the series of conferences of IOP: Earth and Environmental Sciences, 2021, v . 1. 659, issue . 1, p . 12022.

3. N. G. Baiboboev , A. L. Muminov , Statistical analysis of sizes elevator based on observations of the technological process of mechanization Card harvesting machine. Scientific journal Mechanics and Technology. Moisture No. 1 (10), 2023.

4. N.G. Baiboboev , A.L. Muminov , Kh.T. Rakhmanov Study of the department Soils as a random Markov process. Scientific and technical FerPI magazine . 2023. Roof 27. No. 4. st. 93-97.

5. Sveshnikov A.A. Practical theory of random functions. Science M. 1970.

Bendat DJ, Pirson A. Measurement and analysis of random processes. World, M. 1971.

CONTENTS

CHEMICAL SCIENCES

TECHNICAL SCIENCES: MECHANICS AND MECHANICAL ENGINEERING

ADVANCED PEDAGOGICAL TECHNOLOGIES IN EDUCATION