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In Article predstavleny Analytical Results of research and descriptions factors of influence on nadezhnost machines in the system s tehnycheskoho of service.

Nadezhnost, car, Tehnicheskoe of service.

In paper results of analytical researches and description of factors of agency on reliability of mashines in system of its maintenance service are presented.

Reliability, mashine, maintenance service.

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The technique of comparative evaluation Grinders Feed Grains

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The variant improve methods of comparative evaluation of machine for grinding grain feed.

Grinders grain productivity, energy, the degree of grinding, the coefficient of variation.

Problem. For the existence and development of the livestock industry important rational use

fodder. In this connection special significance takes to develop criteria and methods for evaluating the effectiveness of technological methods of processing feed raw materials, and the choice of means for their implementation

One of the most important and mandatory training of feed manufacturing operations, particularly grain for feeding is crushing [1]. In practice kormopryhotuvannya crushing process is seen as a process of destruction of feed grain to produce a product with optimum particle size of particles needed for effective use.

The optimum particle size of feed particles is determined scientifically based breeding recommendations, depending on the species and age of animals and birds, the type of grain and the nature of its use (feeding alone or as part of the mixed feed or feed) [1,2].

High quality grinding feeds provide a set of measures related to improvement of machine-chopper, increased requirements for process control and monitoring products shredding.

Analysis of recent research. The main parameters during the grinding process are known [3], the performance of specific energy Q and q (energy consumption per unit of production) equipment

$$q = \frac{N_n}{Q}, \tag{1}$$

as well as the quality of the product. However, the overall performance can be outstanding criteria, as determined by a number of structural and technological parameters in the first place - working chamber size and working bodies, kinematic modes shredders, physical, mechanical and technological properties of the feedstock.

A more objective criterion can be considered performance per unit surface area of the working chamber. Specific indicators reflect the full value of the load space usage grinding chamber, operating machinery and largely determine the metal and energy process. However, the specific load and power consumption do not address the quality of grinding.

For a comparative evaluation of means used indicator based on energy content Yong achieved degree of grinding:

$$E_н = \frac{q}{\lambda}, \tag{2}$$

where - Nn power consumed for grinding (net of losses idling); λ - the degree of grinding material processed.

But in this case the energy assessment is carried out without regard to grain size uniformity grinding products that are not fully satisfies the efficiency of feed. It is known that the fractional decrease in the coefficient of variation of the product during the grinding of feed materials for every 10% during the feeding of animals in the technological equivalent additional production efficiency or save 1-3% of the feed. Therefore, to assess the qualitative aspect of the process and grinding tools, in addition to the degree of grinding material or size of the final product, must be considered and uniform fractional composition of feed particles.

During the comprehensive evaluation and Compare options Energy effectiveness processes and tools grinding offered [3] determine the subject uniformity fractional composition final Product next read:

- In general -

$$E_к = \frac{q}{\lambda(1-\frac{\nu}{100})}; \tag{3}$$

- At the same size and normalized factor value variations fractional composition product -

$$E_p = q\frac{\nu}{\nu_н}, \quad (4)$$

where - Ek energy process considering achieved degree of grinding material processed and uniformity fractional composition obtained product (complex criterion);
Er - energy process considering compliance uniformity products grinding regulations requirements; υ andυn,respectively - actual and regulatory value ratios variations fractional composition crushed feed.

The purposeResearch identification of the major criteria for evaluation and selection methodology of comprehensive comparative evaluation tools for grinding grain feed.

Results. To justify the choice of an alternative design grain grinders must first of all determine the list of criteria optimization for further construction of the objective function. As mentioned above, it is reasonable comprehensive evaluation on indicators Energy process efficiency and quality of the product. There are basic criteria and requirements for quality grinding feed [1], the average particle size of the feed must meet scientifically sound zootechnical requirements; coefficient of variation of the fractional composition of grinding products should not exceed 45-65%. The upper limit recommended for small and medium grinding grain, lower - for coarse grinding.

However, in addition size of the final product, and the uniformity of their fractional composition must take into account other indicators. In particular, regardless of the ultimate size of the particles during the grinding of grain feed is undesirable formation of dust fractions (as required mashynovyprobuvalnyh organizations, which may not exceed 20%). Excessive dust results in a loss of food, excessive electricity for crushing process, reducing the durability of machines and increase operating costs. Dust particles badly eaten by animals and worse digested [1, 4].

Limited availability and whole grains in grinding coarse grains (0.3-0.5%), ie no more than 6 grains in 100 g crushed product.

To make a comparative evaluation and selection Cutter grain propose to use the resulting quality index method [5]. It is based on the formation of generalized index through intuitive evaluating the impact of partial indicators of quality k1, ..., kn on the quality of the resulting system of its functions. Evaluation of the impact of given group of experts - experts who have experience in developing such systems. The most widely used among the resulting quality indicators obtained additive, multiplicative and mynimaksnyy performance.

For additive coagulation resulting index is the weighted sum of normalized partial indicators, while the multiplicative coagulation - a product of the normalized parameters, elevated to the power of (exponent - weight) [5, 6].

In carrying out multi comparative assessment as appropriate, in our opinion, to use the method of additive coagulation parameters. Used when the criteria for independent significance and can be measured in a quantitative scale. The objective function is:

$$f = \sum_{i=1}^{n} c_i \bar{k}_i \rightarrow extr \quad (5)$$

where $\bar{k}_j$ - *And th* separate optimality criterion in normalized form

B - weight and significance of the first specific criteria

$$\sum_{i=1}^{n} c_i; c_i > 0; i = 1,...,n. \quad (6)$$

The value of the weight coefficient significance criterion B is given by:

$$c_i = \frac{\sum_{i=1}^{n} \delta_{ij}}{\sum_{i=1}^{n}\sum_{j=1}^{n} \delta_{ij}}, \quad (7)$$

where δ_{ij} - The importance of scoring the i-th criterion, which is given j-th expert $i-$ that value criterion; $j-$ index expert; i- index criteria.

Operation normalization eliminates impact on integrated assessment f measurements, the value range of valid values criteria and clarifies its extreme. To enter the normalized values of quality $\bar{k}_1,...,\bar{k}_i$ using the expression [6]:

$$\bar{k}_i = \frac{k_i}{k_{i0}}, \quad (8)$$

where ki0 - some reference (threshold) value ki-indicator of quality.

So to compare grain grinders are appropriate selection of the following variables:

k_1 - Specific energy process, kWh / t;

k_2 - Coefficient of variation,%

k_3- Out dust fraction,%

k_4 - The number of whole (not crushed) grains%.

This choice enables the classical formulation of the problem of mathematical optimization:

$$\left.\begin{array}{c} f(k_1,k_2,k_3,k_4)\to \min \\ \text{за умов} \\ k_1 < k_{10} \\ k_2 < k_{20} \\ k_3 < k_{30} \\ k_4 < k_{40} \end{array}\right\}, \qquad (9)$$

where $k_{10}...k_{40}$ - Limit values of the variables

$$k_{10} = 20 кВт \cdot год / т, k_{20} = 45\%, k_{30} = 20\%, k_{40} = 0{,}5\%.$$

Accordingly, the normalized values of quality determined from the expression:

$$\bar{k}_1 = \frac{k_1}{20}, \bar{k}_2 = \frac{k_2}{45}, \bar{k}_3 = \frac{k_3}{20}, \bar{k}_4 = 2k_4.$$

The resulting normalized values are dimensionless quantities.

Conclusion. Defined Criteria and method allow implement a comprehensive comparative assessment processes and technical means grinding grain based indicators energy and quality grinding,that there is prerequisite for increasing efficiency feed and increase production Livestock.

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Variant proposals usovershenstvovanyya comparative methods otsenyvanyya yzmelchenyya machines for grain fodder.

Grinders grain proyzvodytelnost, эnerhoemkost, the degree yzmelchenyya, utilization rate variation.

The variation of improved technique of comparative assessment of machinery for grain grinding is proposed.

Grain grinders,productivity, local power consumption,crushing ratio, variation's coefficient.