

## DETERMINATION OF HYDRATION INDICATORS OF COARSE FORAGE SIRYUM WHEN PREPARING FEED MIXTURES FOR ANIMALS

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*When substantiating the principle of operation and the conditions for the manufacture of feed mixtures for animals, it is necessary to take into account the mutual influence of many design, kinematic and load parameters, taking into account the physical and mechanical properties of the material being processed. In addition to the influence of traditional mechanical parameters, the efficiency of the use of roughage largely depends on the incentive factors, including the linear dimensions of the output materials - diameter  $D$  and length  $L$ , their moisture  $W$  -, varietal characteristics of maize  $C$ , as well as the relative humidity  $\varphi$  and its temperature  $t$  ° C. Ensuring an efficient process is impossible without achieving neobchidnoivologosti raw materials for which in the mass of the spilled product should be added to the predicted amount of water based on the justification of its amount.*

**Key words:** *feed mixture, parameter, use, preparation, indicator.*

**Formulation of the problem.** As the object of study selected roughage with an initial humidity  $W = 80.5\%$ , subjected to pre-threshing. In accordance with the task, the search parameters are shown in table 1. Qualitative preparation of raw materials for the formation of feed provides the need to use shredders for pre-crushing raw materials with the specified task to obtain linear dimensions of crushed particles.

**Analysis of recent research and publications.** When solving the problem it is assumed to achieve the degree of linear grinding within 3 ... 5, based on the maximum length of the used raw materials with a size of 150 ... 180 mm. As a result of crushing the raw material, the averaged linear particle size should be characterized by a value in the range of 45 - 15 mm [1,2,3]. It should be borne in mind that the rationality of the proposed process of preparation and use of crushed roughage should be confirmed by experimental data on the total energy consumption and particle size distribution of the crushed mixture [1,3].

**Presenting main material.** Preparation of raw materials involves the use of the grinding stage, and the principle of operation of the machine is to break the pieces of product in the working area formed by the structural mechanisms of the grinders. The intensity of grinding increases as the material moves along the working bodies. When conducting experimental studies, a sample of raw materials weighing 5 kg was brought to the required humidity. For this purpose, the coarse material was placed in a hermetically sealed container of the machine with water supply through a hollow shaft and a built-in spray.

Calculations of the required humidification of the amount of water were performed as obtained expression:

$$m_B = \alpha_{\Pi} m_c \frac{W_K - W_H}{100 - W_K}, \quad (1)$$

where  $m_c$  - mass of rods;

$W_H$  i  $W_K$  - initial and final humidity;

$\alpha_{\Pi}$  - correction factor that takes into account the effect of relative humidity and moisture loss during mixing.

Adding to the raw materials a pre-calculated amount of water during the operation of the equipment ensures its even distribution. The prepared raw materials were subjected to grinding in a disk shredder with the established geometrical and kinematic parameters. Sampling for measurements and sieve analysis was carried out when the machines go to the set mode. To assess the effectiveness of the process of preparation of raw materials and grinding, according to the recommendations of the works, we used indicators of grinding coefficients

$K'_D$  and  $K''_D$ , which are due to the ratio of the main linear dimensions and surfaces of the original and crushed particles:

$$K' = \frac{a'_H}{a'_K}; K'' = \frac{S_K}{S_H} \quad (2)$$

where  $a'_H$  i  $a'_K$  - average determining particle sizes before and after grinding;  $S_H$  and  $S_K$  - the total surface area of the product particles before and after grinding.

In relation to the processing of crude raw materials in the grinding of their preparation indicator  $K'$  will be written in the form:

$$K'_d = \frac{L_{CB}}{l_{KCB}}, \quad (3)$$

where  $L_{CB}$ - the weighted average length of the original maize rods;

$l_{KCB}$ - weighted average length of crushed rods.

Table 1. **Parametric indicators of the study.**

Orientation of research	Parameters		
	search engines	constant	variables
Hichmchny composition, food value	-	Humidity $8 \pm 0,5\%$	-
Particle size distribution	Length, diameter, density	-	-
Strength properties	The limit of shear strength, compression	Sample size	Humidity 8... 20%, variation step 2%
Determination of rational values of parameters of the disk shredder	Average length of crushed rods and energy consumption	Humidity $14 \pm 0,5\%$	The gap between the disks is 5... 25 mm, the angular velocity is 10... 50 s-1
Determination of particle size distribution of crushed rods	Length, diameter, density	Humidity $8 \pm 0,5\%$	-
Establishment of rational values of parameters of process of crushing of cores in the car	Weighted average particle size, energy consumption, machine throughput	-	Humidity 8... 20%, exhaust gap 0.2... 8.0 mm, slope of the ribs 20... 70o, speed 500... 1000 rpm
Determination of particle size distribution of crushed materials	Grain diameter, bulk density	-	-
Frictional properties of crushed rods and grits	Angles of natural slope and external friction	-	Humidity $8 \pm 0,5\%$
	Coefficients of external and internal friction	-	The pressure on the product layer is 0.5... 6.0 kPa
Deformable properties of grits	Modulus of elasticity and lateral pressure	Duration 5 minutes	Humidity $8 \pm 0,5\%$ , hydrostatic pressure $H = 2600... 2900$ mm Hg. Art.
Aeromechanical properties of grits	Speed of greetings	-	Humidity 8...20%,
	The ratio of fractions	Humidity $8 \pm 0,5\%$	Air velocity 0.5... 6.5 m / s

**Conclusions.** The expression which allows to carry out the forecast of addition of water to raw material for carrying out effective process of preparation of raw materials as a filler of a forage mix is received.

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### **ВИЗНАЧЕННЯ ПОКАЗНИКІВ ЗВОЛОЖЕННЯ ГРУБОЇ КОРМОВОЇ СИРОВИНИ ПРИ ВИГОТОВЛЕННІ КОРМОВОЇ СУМІШІ ДЛЯ ТВАРИН**

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*При обґрунтуванні принципу дії й умов виготовлення кормосуміші для тварин необхідно враховувати взаємний вплив багатьох конструктивних, кінематичних і навантажувальних параметрів з урахуванням фізико-механічних властивостей оброблюваного матеріалу. Крім впливу традиційних механічних параметрів, ефективність використання грубих кормів значною мірою залежить від побуджуючих факторів, що включають лінійні розміри вихідних матеріалів - діаметр  $D$  і довжину  $L$ , їх вологість  $W$  -, сортові особливості кукурудзи  $C$ , а також відносну вологість повітря  $\varphi$  і його температуру  $t^{\circ}C$ . Забезпечення ефективного процесу неможливо без досягнення необхідної вологості сировини для чого до маси оброблюваного продукту слід додавати прогнозовану кількість води на основі обґрунтування її кількості.*

**Ключові слова:** кормосуміш, параметр, , використання, підготовка, показник.