UDC 636.085.55.4

ANALYSIS OF MIXING COMPONENTS OF FEED

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Abstract. *The production of a more homogeneous granulometric composition of the mixture, compound feed, creates the necessary conditions for the use of continuous mixers, shortens the mixture production cycle and increases productivity. Mathematical descriptions based on the generalization of mixing kinetics data are determined by the relationships between the parameters describing the mechanical movement of particles under the influence of input factors, according to the equilibrium or stochastic characteristics of the process equations. Such representations of the formation of the mixture provide an understanding of the departure of the formation of compound feed, such as energy consumption, time, quality of mixing, etc., which are determined by various indicators that are optimization criteria. At the same time, a mathematical description can be obtained on the basis of deterministic factors that lead to changes in the position of particles in space, or using probabilistic methods to understand the physical properties of particles and their location in the time domain of the mixture formation process.*

Key words: *mixing, compound feed, process, composition, interpretation.*

Introduction. The maximum effect in the preparation of the mixture is obtained by mixing components with identical or similar physical and technical properties. For each group of components, there are criteria for assessing the homogeneity of the mixture, which make it possible to determine the point at which the efficiency of the mixture stops increasing. In studies of mixing processes in continuous systems, an indirect method of assessing the impact of particles and other indicators is often used by determining the time they are in the working area of the machine. This method is based on the analysis of the residence time distribution function of the components mixing in the system. Since the transition from one charged state to another depends on the intensity of the event, it is possible to predict how many n-component compositions containing the final charged state will be formed. Therefore, it is proposed to use the prediction of the achievement of homogeneity as a function of time for evaluation.

Problem. The analysis of phase changes in mixing processes shows that all future stochastic properties do not depend on the method of execution of the process, but depends on the actual state of the process.

Analysis of research and publications. The results of the analysis of the theoretical provisions give reason and [1,3,4] to conclude that, despite the differences in the design of the equipment, the principle of operation, the type of material processing and mixing, after simplifying the assumptions, transformations and operations, most of the equations obtained by the authors for determining the quantity the coefficient of homogeneity of the mixture can be reduced to the following form:

$$P = 1 - \alpha_c e^{-k_c \tau_c} \qquad (1)$$

where α_c - is the generalized coefficient;

τ_c - mixing time;

k_c is the coefficient of the mixer design.

The schematic representation of the change in the phase state of a multicomponent loose mixture [3,4,10] is based on equation (1) and is approximated by the asymptotic exponent in Figure 1. The form of this dependence determines the initial and final stages of mixing, which are conventionally characterized by a change in the surface area of the mixed components. The transition from a separated to a mixed system is indicated by the rectangle below the curve as a function of mixing time. The mixing process of a multicomponent multidisperse mixing system can be integrated into a stochastic process with discrete states with continuous time τc [6,7]. [6,7]. With this view, the i-th state of the volume of the bulk component corresponds to the i-th component of the content product, which is added to the volume of the final product (i=1,2,3,...,n), where n is the number of product components , and the state of the bulk product volume at the moment of time τc is predicted by probability systems P1, P2 and P3. Then the transition of the volume from one state to another occurs due to the action of various flow actions. [5,6,3]

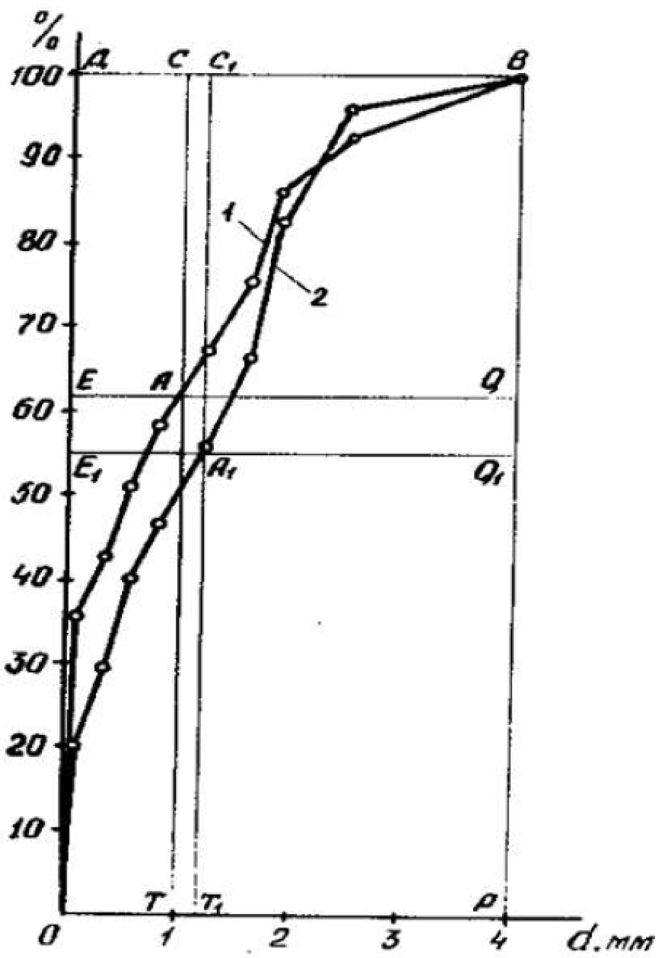

Fig. 1. Cumulative composition curves of loose compound feed.

Materials and methods of research. The weight distribution of the granulometric composition of bulk feed was evaluated on the basis of sieve classification.

Research results. The results of the analysis of the laboratory mixing process show that, compared to recipes of different purposes, they have the same coefficient of homogeneity of mixing. This view is consistent with the fact that mixing highly dispersed components takes a long time. Due to the large variation in grinding ratios, long mixing times are required to achieve the same mixing homogeneity ratio. The feed fraction for laying hens contains more than 50% of small particles, which reduces miscibility. Energy costs per unit of processed material during grinding are inefficient, do not meet the zoological requirements for poultry nutrition, and marketability is compromised by reduced feed intake.

Conclusions. The homogeneity of mixing, to which different recipes with n components that make up the final state of the mixture, reach production stocks, can be estimated taking into account the fact that the transition from one bulk state to another is affected by the intensity of the flow of events. Therefore, an equation is proposed that allows to estimate the achievement of homogeneity as a function of time.

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