International Journal of Engineering, Science and Mathematics
Vol. 7Issue 7, July 2018,
ISSN: 2320-0294 Impact Factor: 6.765
Journal Homepage: http://www.ijesm.co.in, Email: ijesmj@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

# VIBRATIONAL MIXING OF FREE-FLOWING FODDER MIXTURES

**Raupov Turgun Abduvaitovich**
Tashkent Institute of irrigation and agricultural
mechanization engineers. Tashkent.
Uzbekistan, Tashkent, Kori Niyoziy str., 39

**Annotation**

In the article theoretically and experimentally, the ranges of variation of the basic regime and geometric parameters of the vibratory installation, at which the continuous process of preparation is realized a multicomponent mixture with guaranteed quality. Mathematical models of pseudo-continuous and discrete movement of bulk material on an inclined vibrating tray. On the basis of the proposed models and obtained analytical dependences, a simulation model of the process of continuous preparation of multicomponent mixtures, which allows to predict quality of the finished mixture. A physical model is proposed based on the functional connection of the potential energy of a portion bulk material and the rate of change of this energy under the influence of vibration, which allowed obtain analytical dependencies for calculating the basic parameters characterizing the distribution loose material relative to the inclined vibrating tray.

**Key words:** vibrational mixing, fodder mixtures, multicomponent mixtures

material relative.

## Introduction

Multicomponent mixtures of granular materials are widely used in various industries. The key equipment in the cooking process mixtures are component dispensers and a mixer. Many researchers note that when designing Mixing plants must take into account the characteristics of dispensers. Despite a large number of works relating to the calculation and design of metering devices and mixers, practically.

There are no studies of dosing and mixing plants as a whole. Furthermore, as shown by the analysis of the designs of batchers and mixers, as well as the methods for their calculation, mutually exclusive design requirements. In recent years, technology has developed two-stage dosing of bulk materials, which allows to increase the accuracy of dosing.

One of the advantages of this technology is the high uniformity of the flow, even with estimates for short intervals. This dignity opens new perspectives in the organization of a continuous process of preparation of multicomponent mixtures. At the same time, there are no studies of joint functioning of metering devices and mixer. Traditional mixer designs, as well as well-known dousers implementing the technology of two-stage dosing, cannot fully implement all the advantages of this technology for the preparation of high-quality multicomponent mixtures.

**Object**

Investigation of the interrelations between component dispensers and a mixer, the creation on this basis a mathematical model of the process of continuous preparation of multicomponent mixtures, improvement of designs and methods for calculating regime and design parameters dosing and mixing plants.

To achieve this goal, the following tasks have been accomplished: analysis of continuous dosing and mixing of bulk materials, as well as devices for the implementation of these methods; the process of transformation of individual portions of material into a continuous flow on a vibrating ramp; the influence of geometric and regime parameters on the accuracy of dosing; The mixing of components, including those prone to segregation, on a vibrating sectioned conveyor. The design of the vibrating installation for the preparation of a multicomponent mixture, and a procedure for its calculation is proposed.

**Materials and methods**

In this connection, there was a need to develop new methods for dosing and mixing granular components and design techniques for metering and mixing plants that implement two-stage dosing technology. Components must mixed which arrive at the adoptive end of trough. Under impact of vibration mass Moves along the crest and mix with them.

Oscillations should be gentle intensive, ensuring without stopping moving of equal thin layer inside of mixing troughs. Thus, there will be practically altered interchanges of individual parts and monolayers.

In a thin layer, the pulse force from the trough will be constant; hence, the difference in the dynamic Condition of mass will be rule out. In this way, by application of gentle intensive oscillations will be guaranteed to achieve:

1) The total mass change inside the mixing organ, which is necessary to ensure the working process;

2) Decreasing in the effective friction coefficients, which facilitates the action of the teeth on the mass.

In this case, the layered displacements will be slightly.

Below the elementary intra-layers of displacement and deformation of the whole layer by the teeth are considered, which are separate components of the mixing process. Disclosure and description of such Elementary inter mixings and deformations as a friction of the parameters of the mixer will be the theory of the process of vibrational mixing of free-flowing fodder mixtures.

Mixing of components in the vibrating mixer come from the followings;

-layer formation by feeders;

-inside layer movements on ragged surfaces (through and teeth);

-active deformation by teeth.

Inside the layered displacements on smooth surfaces are:

1. Floating up and immersion of particles in the layer under the influence of vibrations (transverse mixing).

2.longitudinal relative slip of thin horizontal, layers, in this case, higher layers overtake the lower ones or lag behind them while constant moving of entire layers of the mixed material in the through (longitudinal mixing).

3. Extension (spreading) or shortening of the layer from receiving end to the discharge.

Active deformations of the layer that are created by teeth crest are the followings:

1. Mutual enrichment of the layers of the various components due to their destruction at the descent from the edges of the tooth crest and the relative sliding and friction.

2.Mixing of components with free fall.

3. Mutual penetration of practices of one component into the spaces between the particles of the others when the layers are getting thinner at the edge of teeth crests.

4. Transferring and arrangements of particles of lower layers in the max of the whole layer by the height of crest teeth (vertical mixing).

5. Mixing of components due to the fact that the vertices of the teeth in successively located crests lie in the different vertical plane places parallel for directional moving of mixing mass (the effect of transverse mixing teeth).

6.Longitudinal sliding of the layers due to the difference in the speed of the vibrational displacement of the mass on the main through and on the crest due to different angels of their tilt to the horizon.

Emersion and immersion of particles in the layer

With low-intensity vibrations of superimposed on the mixture, certain particles in the vertical plane can move in it, and there are possible different combinations that depend on the placements of the layers and the physic mechanical properties of components stacked in the layer.

This effect, together with the effect of forming a layer can be use to obtain a qualitative mixture.

Let`s suppose that it is necessary to mix the two components A and B. If component A possesses such physic-mechanical properties that under the influence of vibration can rise upwards in the layer of component B , then component A must be put into the trough first and it will be the bottom layer and the component B is put with an upper layer occurred movements in this case will lead to get a mixture.

With an unorganized giving of components, this effect can`t be used.

When the intensity is low, the relative motion of the particles ends with the deposition of small particles into the pores between the large (blending) ones. The excellent effect will occur with any method of putting the components into the mixer, while playing a positive role. Such a stacking of particles doesn`t end during the process of movement, the masses inside the trough, because the main effects of the phenomenon will be caused by the teeth, but the very presence of this tendency with the basic mixing effects plays a positive role. There is no such dynamic state of mass in most well-known mixers, where there is inverse process-separation whith the main process.

Now, it is possible to clarity finally the purpose of low-intensive vibrations while mixing;

1. Carry out a general mixing of the mass along teeth crest which mixes it up.

2. To reduce the cohesion forces between the particles that encircles the effect of teeth on the mass.

3. Creating an advantageous dynamic state of the environment preventing separation on the background where teeth mix components. Relative sliding of horizontal layers.

As already mentioned above, the use of an uninterrupted displacement of thin layers will be significantly weakened according to the displacement of monolayers to each other.

Remained slight slip slides of the monolayers will contribute to smoothing unevenness in the work of the dispensers. In any form of putting components into the mixer, the continuous flow of dispensers will disperse the components unevenly, in the form of ,``portion''. Therefore, the mixer should not „smearing'' the portions of the components along the mixing organ so that they are not so sharp or not at all felt at the outlet of the mixer. This can be achieved by the relative slip of layers in a direction that coincides with the total mass movement. In this sense, the relative slip of the layers will contribute to reclamation of the layers will contribute to reclamation of the fluctuations.

Mixing at removing from the edge of teeth crets. Removal of mass from the edge of teeth crests can be occurred in the form of a small cleavage (Figure 1,a) or by release of a large cleavage

(Fig,1).

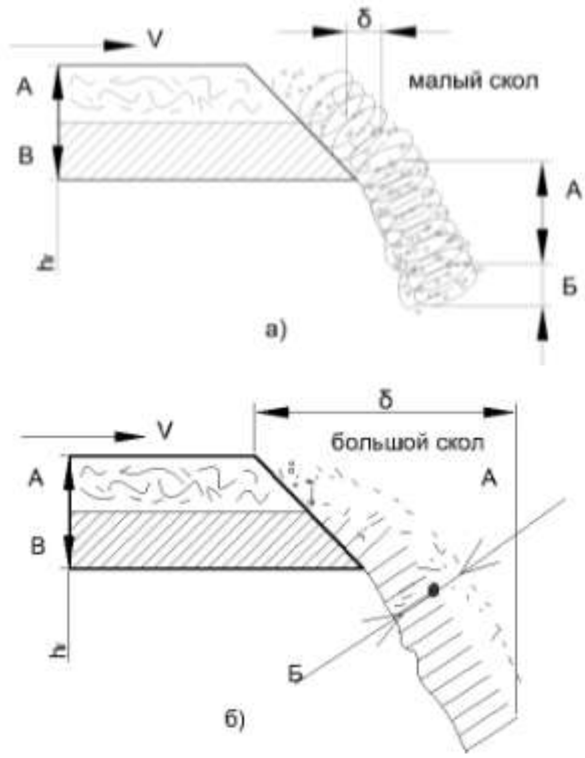


**Figure 1. Removal of the layer from the teeth of crests.**

**Conclusions**

The values of little cleavage varies from min equal size of one particle with good flow ability up to max of equal thickness of the layer with little free- flowing. In the case of large cleavage size max gets to the value of 2A +h but in this case mass is multiplied (A–amplitude of oscillation of the trough, h-thickness of the layer in the crest). Moving layers of A and B in vertical direction takes place in the moment of falling of the previous cleavage relatively to the next one. Cleavage has component A and component B in its contain at the moment of passing through of component B of the next cleavage (Fig 1 a) occurs inter enrichment of component A with the particles of component B, and for the subsequent cleavage of layer B is enriched with particles of fraction A of the previous cleavage; on the whole, mixing of components in the plane YZ is happening. Obviously, how thinner is cleavage, the more likely the particles of one faction will fall between the particles of the other one. i.e., the quality of mixing will be higher.

This can have achieved by increasing number of cleavages in the time unit (by increasing frequency of vibration). At the same time, the thickness of cleavages is dropping and uniformity of cleavages is increasing in time and in weight dimensions.

## Literature

1. Patent for profitable model of UZ FAP 00562 Device for mixing of fodder from 30.07.2010.

2. Diyachkov V.X Vibrational conveyor and feeder //Pub I BHUUPTMAW, 1960-NUMBER 5.

3. Durmanov A.Sh., Roy Browne (UK)/ The impact of trans-boundary water flows to social-economical and ecological balance in Central Asia. TIMI, International Scientific and Practical Conference "Problems and Prospects of Effective Water Management in Globalization Conditions" Tashkent - April 11-12, 2017 (125-128)