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Mountains for Preliminary Division of Mass by Fraction Coefficients

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Annotation: The article presents the process of separating crop yield components based on the difference in their friction coefficients, particularly during the harvest of potatoes by potato harvesters. At the same time, components with a large friction coefficient will be carried out by the ridge, and components with a small friction coefficient will be rolled out of it. Therefore, hills are used to separate small plant impurities.

Keywords: ridge, components, potato, potato harvesters, friction coefficient, plant impurities, longitudinal ridges, transverse ridges, tuber, stem, stem, web, friction balloon, sliding speed, conveyor - conveyor.

Separation of components by the difference in their friction coefficients is widely used in grain cleaning machines. It also found application in potato harvesting machines. The separation process using this method is as follows. If a mass is uniformly supplied to a moving surface (hump), then the latter, depending on the value of the friction coefficients of individual components, will be dragged by this surface differently: components with a large friction coefficient will be carried out by the hump, and components with a small friction coefficient will be rolled off it.

Hills are divided by their appearance and design into longitudinal and transverse, and as a type of longitudinal hill, a friction balloon. The difference between a longitudinal ridge and a transverse ridge is that in the first axis of the driven and driving drums, on which an endless rubberized strip is stretched, they are parallel and horizontal; in the second axis, they are parallel and inclined. There is also a difference in the direction of mass delivery to these hills. On the longitudinal ridge, the direction of the fabric movement and the direction of feed coincide, while

on the transverse ridge, they are mutually perpendicular. Additionally, on the transverse ridge, the mass is fed to the upper part of the moving fabric at the beginning of the movement.

The mechanics of the hill separation process for grain crops has been sufficiently studied and described in the works of Terskov S.A., Letoshnev M.N. and others.

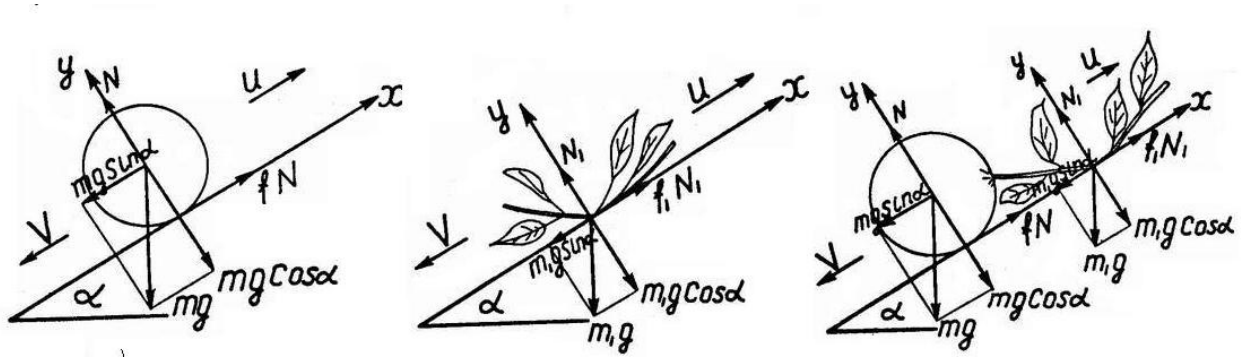
Applied to the separation of potato tubers from the stem of the stem, the known theoretical provisions will look somewhat different.

Let a mixture of tubers and clumps flow onto the longitudinal ridge without initial velocity. In this case, various interactions between the tubers and stem of the leaf can occur.

The two most characteristic are (Figure 1):

1. The tubers and stems of the shoots are separated at the moment of reaching the ridge and at the moment of separation at the ridge (Fig. 1, a and b);

2. The tubers have a connection with the stem. Moreover, this connection can be expressed not only in the direct holding of tubers on stalls, but also in any other form, in particular, the tubers can be tangled in the thickness of the stem, etc. (Fig. 1,c).



a) *b)* *c)*

Fig. 1. Diagram of separating tubers and stems on a longitudinal ridge

For each of these diagrams separately, the known formulas for the velocities of the body's sliding down the pavement can be fully applied [4]:

for fig. 1,a

$$V = U - g\sin\alpha\left(\frac{tg\varphi}{tg\alpha} - 1\right)t \quad (1.1)$$

for fig. 1,b

$$V = U - g\sin\alpha\left(\frac{tg\varphi_1}{tg\alpha} - 1\right)t \quad (1.2)$$

where V - is the speed of tubers or cobs sliding across the web, m/s;

U-movement speed of the fabric, m/s;

g - acceleration due to gravity, m/s^2;

- hill inclination angle, degrees;

-tubers and cob friction angles, grain;

t - the time it takes for the tuber (stem) to move along the web, s.

As can be seen from these formulas, the speed of a body's sliding depends to a greater extent on the difference enclosed in brackets. Let this difference for Fig. 1,b be greater than zero, i.e.

$$\frac{tg\varphi_1}{tg\alpha} - 1 > 0 \text{ or } tg\varphi_1 \rangle tg\alpha.$$

This is the case of slow down sliding. At the same angle, in the case of the tubers (Fig. 1, a) $\frac{tg\varphi}{tg\alpha} - 1$, the difference will approach zero, and may even be less than zero, $tg\varphi < tg\varphi_1$ since (the coefficient of friction of sliding is greater than the friction of rolling).

Consequently, the slowing of the sliding velocity will be slower than for the panicle, and at a certain value of the angle, the sliding velocity for the stem will be negative and it will move upward; the tuber, on the contrary, will roll downward, even with acceleration. Thus, separation occurs.

For the case where the tuber is connected to the stem, the downward sliding velocity will be represented after compiling and solving the differential equation of the tuber's motion with the stem on the ridge bed moving at a velocity U (Figure 1, c) in the following form:

$$V = U - g\sin\alpha\left(\frac{tg\varphi + tg\varphi_1}{tg\alpha} - 1\right)\cdot t\,. \quad (1.3)$$

The physical essence of this formula lies in the fact that the tuber loses its ability to roll, as it tends to slide downward along with the stem. It is quite understandable that, since the coefficients of friction between the tubers and the cob are summed, at the same value of the angle at which the separation of unbound tubers and stems occurs, it is possible to remove a heap of tubers with the cob from the machine. There might be another case: they slide down from the hill and can serve as a cause of product clogging in the potato harvester's container.

The practice of working ridges on KKU-2, KKU-2A combines and a number of foreign ones - "Pakman," "Widded," "Johnson," and others - confirms the stated provisions that high-quality separation of ridges is possible only when the stem and tubers are not connected to each other and their supply to the ridge is uniform and small.

In any other cases, the technological process is disrupted, and 10-15% of the tubers are lost.

Observations show that the application of the newly incoming mass from the feeder to the partially separated mass on the ridge, as well as the countercurrent, when the rolling of tubers downwards is hindered by the incoming mass moving towards the ridge, especially strongly affects the quality of ridge operation. In this case, the tuber is carried away and can be thrown out of the car. With a small dispersed feed, the effect of the countercurrent is less noticeable. Thus, we can conclude that hills are best used for separating small plant impurities. In some combines, this is currently being applied.

In addition, the transverse ridge can be used as a conveyor for preliminary separation of the mass by friction coefficients with subsequent manual cleaning, which is currently also widely used in potato harvesters in both CIS countries and abroad.

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