

INTENSIFICATION OF GRAIN CLEANING BY INCREASING THE COEFFICIENT OF EXTERNAL FRICTION

Igor GAPONYUK^{1*}

¹*National University of Food Technologies, department of grain storage and processing, Kyiv, Ukraine*

*Corresponding author: Igor Gaponyuk, zenidtar@gmail.com

To bring the grain of the harvested crop to the requirements of the consumer market, it is cleaned in various ways. Instead, the common drawback of most of them is the significant dependence of the productivity of the separators on the humidity of the grain mixture, and for each percentage increase in the humidity of the mixture, the productivity of the separators decreases by 4...5%. Therefore, quite often in production conditions, the actual productivity of sieve separators for cleaning excessively wet grain mixtures is only 16-18% of their passport productivity. This has a bad effect not only on productivity, but also on the indicators of specific energy consumption of all the equipment of the technological grain processing line

The performance of the sieve separator is most significantly affected by the flowability of grain mixtures, and the flowability of the latter by the coefficient of external friction, which in turn is directly related to the moisture content of only the surface layer of the particles of these mixtures.

Our studies have established that for different components of the grain mixture of the same size and shape, the dependence of their flowability on humidity is not the same and the following pattern can be observed: with the same humidity of the various components of the grain mixture, the flowability of the particles deteriorates to a greater extent with a decrease in their volumetric mass and an increase in the active surface.

In accordance with the Research Program, we have theoretically substantiated energy-saving ways of increasing the productivity and efficiency of the process of separation of mixtures of different composition and humidity. The results of these studies, in our opinion, can be applied to most loose capillary-porous bodies with a moisture content of less than 50%, a particle size of up to 0.015 m, a volume weight of up to 900 kg/m³ and for normal (natural) environmental conditions.

In conclusion: 1. It has been experimentally confirmed that the angles of external friction on metal and wooden surfaces for wheat grains in the range of variable humidity from 13 to 28% do not differ significantly (within 0.5 degrees). 2. For particles with a density significantly smaller than the grain, $N < 250 \text{ kg/m}^3$, the dependence of the coefficient of external friction on moisture on the metal surface is manifested several times to a greater extent. 3. The dependence of the angle of external friction on humidity was obtained on the basis of the conducted research. 4. The method is substantiated and mathematical equations for controlling the angle of external friction of wet mixtures are obtained. 5. The method of managing the performance of separation of wet mixtures was proven on a bench installation.

Keywords: grain, impurities, purification, productivity, separators