CHANGE BY MASS EXCHANGE THROUGH A DRIVING POTENTIAL GRADIENT

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Among the various ways to improve the processes of heat and moisture exchange and modes of dehydration of grain products, a separate area should be the method of the specified parameters of moisture absorption capacity of working gases.

However, currently in the technology of known domestic and even modern foreign drying units, the influence of the actual pressure of the gaseous medium in the layer of dehydrated bodies is either ignored or not fully taken into account, referring to the error of the process.

Material and methods: mathematical modeling and empirical analysis, criterion equations, testing.

Results. We have note that at different pressure gradients and the same energy flow of working gases up to 1.8 kPa, the intensity of moisture exchange in real production conditions of the modernized drying unit varied not within the theoretical 4% obtained by known calculation formulas, but in 5– 6 times more - by 22 – 25%! This forced us to single out the factor of the gradient of the flow of working gases into a separate significant factor influencing the rate of interfacial heat and mass transfer. Consider the above example of dehydration of the sedentary layer of grain and compare the calculated with experimental data.

Under conditions of grain drying in a dense sedentary layer of mine direct-flow dryers, the speed of the drying agent at the inlet section of the dehydrated material varies in the range of 0.35 – 0.55 m / s, the thickness of the layer in the space between the boxes is 0.25 m

For these conditions, the aerodynamics drag of the layer of dehydrated material ranges from 600 Pa (corn) to 2500 Pa (castor seeds). The aerodynamics drag causes energy losses in the low of drying gases and related:

a) difficulties in ensuring the specified modes of operation of the drying unit;

b) Different moisture content and driving potential of working gases in the cross section of the layer;

c) Increasing the difference in velocities in the cross section of the dehydrated layer;

d) The heterogeneity of the moisture of the dehydrated material in the cross section of the layer and

e) Additional costs of dehydration energy and deterioration of drying quality.

The values dPi to vary in a wide range and for mine direct dryers acquire values from 0.6 kPa for corn, 1.3 kPa for wheat and oats, 2.3 kPa and 2.5 kPa for millet and rape. Accordingly, the calculated values of the moisture content of drying gases will increase to 2 – 2.5 %, and their moisture absorption capacity will decrease by the same amount.

Thus, according to the calculated data, the intensity of interphase mass transfer at different gradients of the working gases for a layer of wheat and castor (or mustard) 0.25 m thick will vary within (2.6–2.8)% and (4.8–5.2)%, respectively. The same corrections should be taken into account in the calculations of energy consumption.