DEVELOPMENT OF THE EXPERIMENTAL MODEL FOR THE FRACTIONATION OF POWDERFUL PRODUCTS (DERIVATIVES) IN THE MILLING INDUSTRY

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Introduction

In milling enterprises, for the optimal organization and management of the technological process related to the preparation of bread flour, the separation of derivative products (groats) according to quality parameters into fractions with different physical and technological properties is of particular importance [1,2].

Research Methodology

The technological process of grinding cereal grains into derivative products (groats and flour) consists of a totality of procedures and actions for their processing with the aim of obtaining high-quality derivative and final products [1,2]. In the mill room, vibro-pneumatic separators can be used as groat machines, whose working bodies perform complex spatial movements by applying high-frequency vibrations. As a result of the vibrations, the smaller, lighter, and rougher particles, which have reduced rolling properties, move to the upper layers of the product and end up in the accumulator for waste. The whole, full, and elastic particles with an increased specific mass move in the opposite direction, namely towards the lower layers, closer to the sieving surface, come into contact with the sieve surface, pass through the sieve (or sieves) openings, and accumulate in the conical accumulator for the sieved product.

Research Results

Vibration action allows for a considerable improvement of the geometric and kinematic parameters – the acceleration and frequency of the working body are increased 5-10 times, and the oscillation amplitude is decreased 6-8 times compared to existing machines. The vibropneumatic separator has an advantage over existing separation/sorting installations, as it has the possibility of adjusting the trajectory of particle movement (groats, middlings, flour particles) on the sieve surface (sieves), playing a decisive role in increasing the technological efficiency of qualitative separation of derivative products when grinding wheat batches into bread flour. The indicators of the technological efficiency of the vibro-pneumatic separator operation are presented in Table 1.

Table 1. Indicators of the technological efficiency of the vibro-pneumatic separator operation

Denumirea produsului	The size of the sieve holes	Mass of the upper weight kg	Mass of the lower weight, kg	Air flow speed m/s	Vibration frequency (oscillation), s-1	Ash content, %, of the initial product	Ash content, % of the rejected product	Ash content % of the sieved product	Ash content, % of the light product	Yield of unmelted product %	Yield of sieved product %	Light product yield %	Technological efficiency E, a V cone.	Productivity, kg/h
Large grains	1,412	0,10	0,10	1,00	25	1,05	1,46	0.65	3,98	11,3	80,0	8,7	1,29	242,0
Medium grains	1,093	0,10	0,10	0,60	30	0,78	1,02	0.58	2,62	8,1	84,0	7,9	1,14	223,0
Small grains	0,450	0,20	0,20	0,40	35	0,65	0,93	0,51	2,23	5,3	90,0	4,7	1,15	218,0

Conclusions

The results indicate that the speed of the ascending air flow for processing coarse groats is 1.10 m/s, for processing medium groats – 0.60 m/s, for processing fine groats – 0.40 m/s.

Keywords: *cereals, derived products, milling, vibrofluidized powder product, vibropneumatic separation*

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