SMALL-CAPACITY UNIT FOR FLOUR PRODUCTION AND PANIFICATION

Abstract

Providing the population of small settlements with flour and bread in modern conditions requires energy expenditure on the transportation of grain to the mills, and then to the bakeries and bread itself to the settlements. Therefore, the organization and access into the modern market of the small-capacity units that allow processing of grain at the place of its cultivation into flour and bread at a minimum of energy expenditure and in the best use of anatomical parts of the grain are important.

Flour and bakery industries play a major role in providing Ukraine such socially important products as flour and bread. Ukraine today has adequate potential to procure provisions of food grain for flour and bread. Despite the gradual decline in bread consumption in Ukraine, which is observed in recent years, flour and bread are strategically important products, the production of which brings steady income.

The proposed version of the small-capacity unit in comparison with those released and produced by industry both in Ukraine and abroad, is a simplified version of the powerful means of rolling mills, and that leads to reduction of level in the use of anatomical parts of grain by increasing of the specific energy consumption per unit of the produced products 2-2.5 times more. Thus the most valuable anatomical parts enriched with protein, microelements and vitamins (aleurone layer and germ) do not get in the product of grain processing and are displayed together with brans or partly get in flour of lower quality, which reduces the biological value of flour of the first and higher qualities. In this regard, there was a necessity to create such installation units that could be available for usage in agricultural and large farming enterprises and would allow to get flour and bakery products at the best use of anatomical parts of grain.

Keywords: grain, small-capacity unit, production of flour, panification.

Providing flour and bread for population of small settlements in modern conditions requires energy expenditure on transportation of grain to the mills, and then to the bread-baking plants, and bread to the settlements. Therefore it is essential to create universal small-capacity units that would allow to process grain on the place for its cultivation into flour and bread at the minimum of energy expenditure and at the best use of anatomical parts of grain.

Small-capacity units that were produced and are being produced by industry both in Ukraine and abroad [1, 2] are the simplified variants of the powerful roller mills, and that leads to reduction of level in the use of anatomical parts of grain by increasing of the specific energy consumption per unit of the produced products 2-2.5 times more. Thus the most valuable anatomical parts enriched with protein, microelements and vitamins (aleurone layer and germ) do not get in the product of grain processing and are displayed together with brans or partly get in flour of lower quality [6], which reduces the biological value of flour of the first and higher qualities. In this regard, there was a necessity to create such installation units that could be available for usage in agricultural and large farming enterprises and would allow to get flour and bakery products at the best use of anatomical parts of grain. To achieve this aim an installation unit is offered, the scheme of which is shown in Figure 1.

Grain after rough cleaning at the current is delivered into the hopper 1, from which it enters the aspirating chamber 2, where heavy and light impurities are separated from it, farther grain moves to the grain cleaning machine 3 [7] in which it is cleared up from large, shallow, long and light impurities which are collected in the bunkers 4, 5 and 6. In the aspiration chamber 7 aerodynamically light admixtures are separated from air, farther air is delivered by the ventilator 8 to the cyclone 9 for separation of dust. The cleared grain is delivered to the hopper 10 of the spray-damping machine 11, where it is washed, moistened, and superfluous moisture is wrung out from it as well. Water is delivered to the machine 11 from the pressure tank or water-pipe (in fig.1 is not shown) through the pipe 12 where it is mixed with grain, than it washes, moisturizes and wrings out damp grain by the auger 13. Moisturized grain is delivered by the auger 13 into the bunker14 where it is dampened for a few minutes, due to that the shell is moistened and gets elasticity, and its links with the endosperm are diminished. For the separation of ferromagnetic admixtures grain is delivered to the magnetic column 15, and from it into the roller machine 16, where it is flattened for providing of the minimum fineness of shells and endosperm. The got loose cereals are delivered by the worm 17 by magnets 18 on further processing. If it is flour only to be got, cereals are completely delivered into the machine for separating the shells from the endosperm 19 by the drum sieves, in which the proportion of cereal endosperm is crushed further and separated from the shells on the sieves. Passing through the sieve flour is cleaned of ferromagnetic impurities and is delivered into the supply hopper 20 and the shells into the supply hopper 21. If it is bread products to be got, a portion of cereal (50-70%) is delivered to the rotary machine 22, in which activated yeast and water are delivered from dispensers 23. Leavened dough is kneaded in machine 22 and delivered into unit 24 for fermentation. During the fermentation the endosperm and germ swell, forming a colloidal solution and minerals and vitamins are adsorbed from the shells. After fermentation the leavened dough is delivered into the worm machine 25, where the leavened dough is separated from shell through a conical sieve with holes of 0.4-0.8 mm in diameter. The clean dough is delivered into the machine 26 for kneading of dough, to which...
Fig. 1 – The scheme of small-capacity unit for flour production and panification

Flour is delivered by the dispenser 27 from the machine 19 and liquid components (salt solution, sugar, fat, etc.) by the dispenser 28. The resulting dough is delivered into the hopper of the dough makeup unit where it comes final fermentation and is divided into shapes, rounded in the rounding machine 30, placed on shelves of the container 31, proofed in the proofer 32 and baked in the oven 33. After baking bread is served on cooling and implementation. Shell, which are derived from the machine 25 is delivered into the hopper 34 for the further use in animal husbandry.

Aggregate unit can be used for bread baking with flour produced in the other roller mills.

For this purpose flour is served into the hopper of the worm 17 and after the magnetic catcher into the machine 19 for redressing, then one part of flour is served into the machine 22 for kneading, and then into the apparatus 24 for fermenting dough. After fermentation leavened dough is delivered into the machine 26 [9], where the second part of flour is delivered by the dispenser 27 and liquid components by dispenser 28, the dough is kneaded. Then the dough is divided into pieces in the separating machine 29, they are rounded in the machine 30, placed in the container 31, proofed in the proofer 32 and baked in the oven 33. The resulting bread is
implemented. Sieves with holes of 1.8-2.4 mm in size are installed into the machine 19 for controlling of flour. The apparatus (unit) can also get high quality whole-wheat flour by replacing the smooth rollers on grooved ones and by setting the roll transmission with gearing ratio of 1.5 or 2.5 to the roller machine 16. Thus offered method of obtaining bread of grain allows to create an economic, universal, simple small-capacity device for producing flour and bread, suitable for the use in the collective agricultural enterprises and farms as well.

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МАЛОГАБАРИТНА УСТАНОВКА ДЛЯ ВИРОБНИЦТВА БОРОШНА І ХЛІБА

Анотація
Забезпечення населення маліх населених пунктів борошном та хлібом в сучасних умовах потребує великих затрат енергії на перевозку зерна до млинів, а потім до хлібозаводів, а хліба до населених пунктів. Тому важливим є створення універсальних малогабаритних установок, які дозволяють б переробляти зерно на місті його вирощування в борошно і хліб при мінімальних затратах енергії і при найкращому використанні анатомічних частин зерна.

Борошно-хлібопекарська промисловість відіграє важливу роль у наданні Україні таких соціально важливих продуктів, як борошно та хліб. Україна сьогодні має достатній потенціал для вирощування харчових зернових для борошна та хліба. Незважаючи на поступове зниження споживання важливих продуктів, як борошно та хліб, Україна сьогодні має достатній потенціал для вирощування харчових зернових для борошна та хліба при найкращому використанні анатомічних частин зерна.

Запропонована малогабаритна установка в порівнянні з тими, які випускалися і випускаються в Україні, що використовується виробниками в аграрській промисловості відіграє важливу роль у наданні Україні таких соціально важливих виробів при найкращому використанні анатомічних частин зерна при збільшенні питомих затрат енергії на одну одиницю продукції в 2-2,5 рази. При цьому головним критерієм є сумісність з термінами та мікрорелаксаціоною відновлюючим вагонових зернових станцій. Нехарактерно для виробничих установок, які використовують виробничі установки при малої коефіцієнта використання анатомічних частин зерна.

Заключно слова: зерно, малогабаритна установка, виробництво, виробництво борошна, виробництво хліба.

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