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TECHNOLOGICAL PRINCIPLES OF EXTRACTION OF STARCH FROM WINTER WHEAT GRAIN

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Abstract:

Like any polysaccharide, starch can be converted into glucose in the acidic environment of the stomach, which enters the brain with the bloodstream and nourishes it. Glucose provides energy, so both adults and children should consume enough starch in their daily diet. In our scientific researches, the technology of processing wheat grains and extracting starch raw material from it was studied on a large scale.

Keywords: wheat, grain, flour, dough washing equipment, starch.

Foodstuffs (bread, cereals, pasta, etc.) obtained from cereals are important consumer products necessary for human life. The peculiarity of cereal crops is the synthesis of extremely valuable organic substances for the human body. The grain contains larger amounts of dry matter than other agricultural products, which act as food fibers in the body. Food fibers perform their important functions in the human body, such as digestion, Radioprotection, normalization of cholestyrin and sugar levels in the blood, and most importantly, the Prevention of various tumor cancer diseases, which are now called "disease of the century". In this respect, we will never be spoiled by cereals, especially bread.

Reviews of food consumption in the world indicate that 50% of protein substances, 70% of carbohydrates and 15% of fatty acids are obtained from cereals and seeds. Of the carbohydrates, wheat and corn grain store the highest amount of starch (in wheat – 78-82%, in corn – 54.3-59.8%). If 600-700 g of carbohydrates is required for a person's daily need, then 550-600 grams of it are starch [2].

In the food industry, starch is used for the production of glucose, molasses and ethanol, in the textile industry for the processing of fabrics, and in the paper industry as filler. In the world industry, starch is most often used in the production of cellulose-paper, which annually amounts to millions of metric tons. In addition, starch is used in the production of most sausages, mayonnaise, ketchup and other products.

Modified starch is the main ingredient in wallpaper glue. It is used in the pharmaceutical industry as a complement to pill forms of drugs, for the preparation of a series of infusion solutions for intravenous administration of certain medicinal capsules, dextrans (dextrins) (polyglucin, rheopolyglucin,etc.) [3].

That is why the technology for the production of starch from wheat grain is now one of the most pressing problems not only in our republic, but throughout the world.

This problem is also highlighted in paragraph 18 of the PQ-113 of the president of the Republic of Uzbekistan dated 05.04.2023 "on additional measures to expand and support the production, processing of agricultural products in 2023"entitled"measures to increase the share of processed agricultural products in the export volume of general food from 30 to 37%" [1].

Based on the above, soft and hard wheat varieties were obtained in laboratory conditions and R & D work was carried out in the laboratories of the Institute of counter-engineering and economics «technology of storage and preliminary operation of agricultural products" and "technology of food products". In the laboratory, wheat grains were rolled into flour in a mini mill, and the dough was fried. Then this dough was used in the general washing method, and starch was separated [4].

Based on our laboratory experiments, the technology for the production of starch from soft and hard wheat varieties and this line of technology has been developed.

The productivity of the starch production line from wheat flour is 240 t/Day.

Starch washing $$Q_{kraxmal\cdot yuvish} = 1{,}2 \times 240 = 288 t/sut \qquad (1)$$

Starch taking $$\frac{Q_{kraxmal\cdot olish}}{24} = \frac{288}{24} = 12 \qquad (2)$$

1. Number of bunkers for storing flour

Starch taking $$E = \frac{Q_{kraxmal\cdot olish} \times t}{24} = \frac{288 \times 30}{24} = 360 \qquad (3)$$

Where the shelf life of t –flour is t=30 s
The volume of flour in it (m3)

$$V = \frac{E}{Y \times K_g} = \frac{360}{0{,}75 \times 0{,}85} = \frac{360}{0{,}6375} = 564{,}70 m^2 \quad (4)$$

The bunker has an elevation of.
Taking h=9.6 m (two floors), we determine its total area (m2).

$$F = \frac{V}{h} = \frac{564{,}70}{9{,}6} = 58{,}82 \approx 59 m^2 \quad (5)$$

We take the square section of bunkers with side dimensions of 3 m. The size of its area will be as follows:

(6) $F_1 = 3 \times 3 = 9 m^2$ *(6)*

The number of bunkers in this case:

$$n_g = \frac{F}{F} = \frac{59}{9} = 6{,}5 \approx 6 ma \quad (7)$$

2. Automatic weighing:

In normal operation, the automatic balance is designed for 3 weightings in one minute. Size 50, 100 kg. The working productivity of the scales is equal to kg / s. If the load capacity of an automatic scale is 100 kg x 3 = 300, it weighs n = 50 x 3 = 150 kg per minute. We accept automatic scales. We choose scales D-50-3EE with a load capacity of 100 kg.

3. Calculation of the number of separators

It is used to separate bran from flour and other substances that have fallen into the flour. Productivity of the equipment is 12 t/h PSB brand.

$$n_{sep} = \frac{Q_{kun}}{q} = \frac{6{,}5}{12} = 0{,}541 \approx 1 \quad (8)$$

So, we choose 1 separator equipment.

4. Calculation of the washing equipment, the productivity of the equipment is 5.2 t/h

$$n_{yuv} = \frac{6{,}5}{5{,}2} = 1{,}25 \approx 1 ma \quad (9)$$

We choose 1 of the washing equipment.

5. We select drum extractor equipment. The capacity of the equipment is 2.6 t/h

$$n_{eks} = \frac{6{,}5}{2{,}6} = 2{,}5 \approx 2 ma \quad (10)$$

We will get 2 pieces of extractor equipment

6. Selection of centrifuge equipment. The productivity of the equipment is 5.1 t/h

$$n_{sent} = \frac{6{,}5}{5{,}1} = 1{,}15 \approx 1 ma \quad (11)$$

We accept 1 piece of equipment

7. Selection of vacuum filter equipment. Capacity - 1.8 t/h

$$n_{vakuum\ filtr} = \frac{6{,}5}{1{,}8} = 3{,}61 \approx 4 ma \quad (12)$$

We accept 4 vacuum filters.

8. We select a pump device (for heating and supplying water). The capacity is 6.2 t/h.

$$n_{nasos} = \frac{6{,}5}{6{,}6} = 1{,}06 \approx 1 ma \quad (13)$$

We accept 1 pump unit.

9. Selection and calculation of homogenizer equipment. This equipment is used to homogenize the starch composition and deodorize it. Capacity - 3.6 t/h.

$$n_{gomog} = \frac{6{,}5}{3{,}6} = 1{,}80 \approx 2 ma \quad (14)$$

We accept 2 homogenizers.

10. We select the starch drying equipment. Capacity 3.8 t/h.

$$n_{qur} = \frac{6,5}{3,8} = 1,71 \approx 2ma \qquad (15)$$

We accept 2 pieces of drying equipment.

11. We select clean product packaging equipment. Capacity 1.6 t/h.

$$n_{qadoqlash} = \frac{6,5}{1,6} = 1,80 \approx 2ma \qquad (16)$$

We accept 2 pieces of clean product packaging equipment.

The yield of starch is 5-10% compared to dry matter.

240 ------100%

x ---------10%

Based on this,

$$x = \frac{240 \times 10}{100} = 24 \approx 240000кг/сутка \qquad (17)$$

So, the technology of extracting starch from wheat grains at the rate of 240,000 kg per hour, the processes are carried out with such equipment and calculations.

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