



Methods of Improving the Frying Process in the Production of Vegetable Oils

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Article History	Abstract
Received: 13 June 2023 Revised: 12 September 2023 Accepted: 21 September 2023	<i>The article presents the results of research on the improvement of pipeline technological equipment for the production of vegetable oils. "Dry" and "wet" roasting. Influence of water, heat and steam on the roasting process. Processes are carried out in special equipment and units. To do this, moisturizing-evaporating screws, gas boilers are used. Also analyzed are ways to increase the efficiency of frying products in a digester. The physicochemical properties of products are important in the calculation of food processing regimes.</i>
CC License CC-BY-NC-SA 4.0	Keywords: piping, dry, wet, heat, process, solution, moisture elasticity, vaporizer, enzyme, steam, open steam, seed, screw, hydrothermal.

1. Introduction

In recent years, the government of our republic has paid great attention to the development of the oil industry. The technology of cultivation and processing of local non-traditional oil plants has developed, albeit slowly, sunflower, flax, sesame and fruit oil. production has been launched. The activity of oil industry enterprises largely depends on the leaders and their professional skills in the field of management. Today, the "Digital Uzbekistan-2030" program has been implemented in our country, and the decision PO-4699 "On measures for the wide implementation of the digital economy and electronic government" has been adopted.

2. The Main Results and Findings

According to him, by 2023, the share of the digital economy in the country's gross domestic product is planned to be doubled.

In production, the roasting process is carried out in two stages:

Stage 1. Wetting and steaming the solution at the required level;

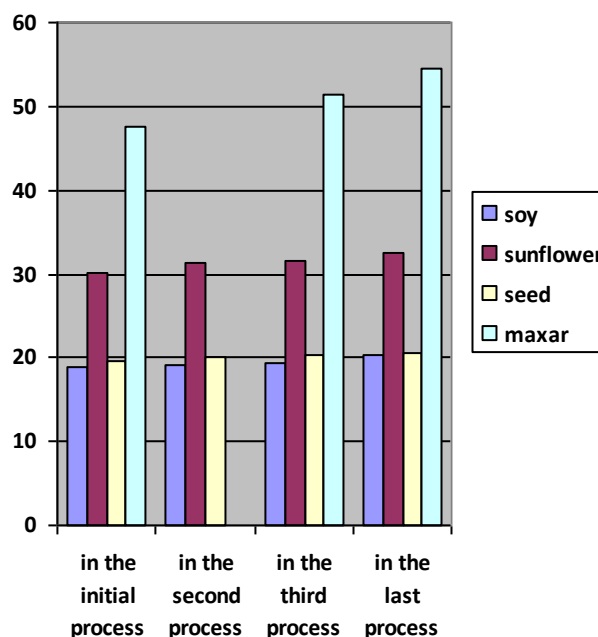
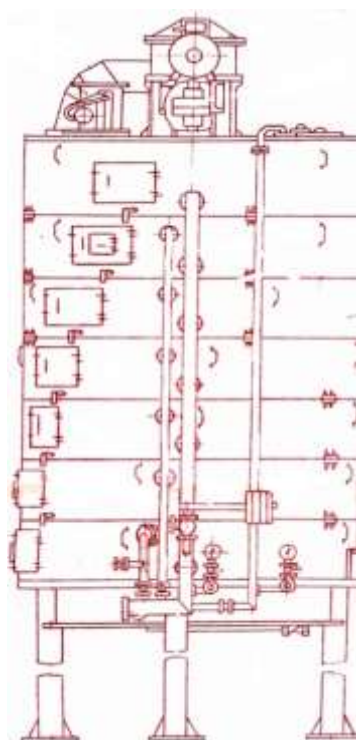
Stage 2. Roasting the soaked and steamed meat.

The 1st stage of roasting is carried out in a humidifying-evaporating screw. At this stage, the solution is moistened with a water-steam mixture and heated using technological steam.

In the 2nd stage of the roasting process, heating of the moistened-steamed meat is continued, that is, the product is brought to such a state that its moisture and temperature have optimal values according to the technological requirements, and the roast should be ready for pressing.

If in the process of moistening, steaming and roasting the seeds, some additional

Table 1



Chemical and biochemical processes occur undesirably, then such oilseeds are prepared by the method of "dry roasting".

It is known that the oil in the crushed product is kept in two states:

1. The thin layer of oil on the particle is called free oil.
2. The oil inside the inner cells that is not digested or partially digested is called bound oil.

On top of that, the oil inside the unbroken cells is additionally held tighter by capillary forces. Because of this, it is extremely difficult to extract oil from the resulting pulp by direct pressing. Therefore, in order to reduce the force of attraction between solid particles and oil molecules, before pressing the product, it is fried with the help of water and heat, and the resulting product is called mezga, i.e. fried. We call this process the roasting process and divide it into two periods: The first stage is to wet the material with water and evaporate it with steam (vlagoteplovaya obrabotka).

The second period consists of direct frying, and in the first period, it consists of heating the product with high humidity using technological steam, i.e. continuing frying and increasing the temperature of the product and reducing its humidity.

According to the points given above, during the frying process, not only the aggregate state of the oily product changes, but also very complex biochemical processes take place.

It is known that all oil seeds contain lipase, a biologically active enzyme. This enzyme has a catalytic property in a moderate and slightly warm state, which leads to the breakdown of triglycerides.

The highly active state of lipase is manifested up to 60-65°C, and at a higher temperature, it begins to lose its activity, and when the temperature reaches 80-85°C, the catalytic activity of lipases practically disappears, because it turns out that lipases enter the protein complex, denature at high temperature and lose their activity. During heating, the amount of oxidizing substances increases. Therefore, during the frying process, it is recommended not to increase

the temperature of the product above 105°C, to reduce the contact of the meat and oil with oxygen in the air, and to prevent the reaction. At high temperature, protein substances undergo denaturation, and moisture has a great effect on it.

Steam is a heat and moisture carrier. If open steam is used in the frying process, the steam first comes into contact with the product at a low temperature and turns into water.

Condensed steam is evenly distributed in the solution. As the liquid temperature then approaches the steam temperature, the steam begins to dry and heat the product without turning into water.

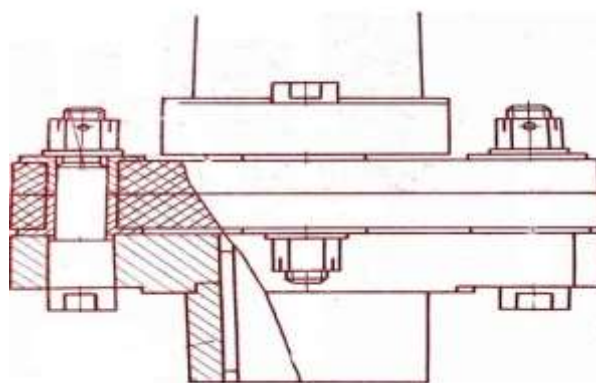
The seed pulp is moistened with saturated steam and condensate in a moistening screw installed above the boiler to 11.5-13.5% for seeds of 1-3 varieties, and to 13.5-17% for seeds of 4 varieties. Temperature for 1-3 varieties 70-800, and for grade 4 it should be 60-700. The dirtier the seed, the higher its moisture content.

The temperature of the product after the 1st round of roasting is 80-85°C, the moisture content is 9-11% for all oilseeds except for cottonseed, 11.5-13.5% for 1-3 types of seed. 4 varieties should be 13.5-15.5% for seeds. The process of steaming and moistening is as fast as possible equal to 15-20°C. After the cauldron fryers, i.e. after the 2nd round of frying, the temperature of the roast should not exceed 100-105°C. For low-grade seeds, it should be 5-10°C lower than the indicated level.

If the product is prepared for pre-pressing, the moisture content should be around 5.5% without extraction, and for pressing it should be 3-4% or 2.5-3%, depending on the type of pressing machine used. The temperature of the roast prepared in this case is higher than that prepared for pressing, it is 110-1200C. At the same time, the amount of shell in the product is limited, and for sunflower seeds, the amount of shell in the roast should not exceed 8-10%, and cotton seed kernels should not exceed 15% for 1-3 varieties, and 17% for 4 varieties. should not increase.

The equipment consists of a seven-cup grill, a screw oil press. The pots of the brazier

Table 2



have a jacket (bottom and shells) heated by saturated steam. The oil press has a cake thickness adjustment device. At the same time, by moistening the material, it is intensively heated for a short time, and the temperature

At 80-85°C, enzyme activity can be reduced or completely lost.

Such an environment can be created in the steaming screws before the frying pans. Different families of oilseeds have their own enzymes, so "optimal" conditions are defined for them.

A heat balance is made to determine the amount of steam required for frying. In this case, the heat balance is made separately for the first tank and separately for other tanks.

Below we will consider the heat balance for the first tank.

Incoming heat (D_j , in): with oil in the core,

Q_1 ; with moisture content of kernel, Q_2 ;

- with added moisture during soaking, Q_3 ;

- moistening with steam, Q_4 ;

- with steam entering from under the hood, Q_6 ;

- with steam supplied to the heating floor, Q_7 .

Heat consumption (D_j , in):

- with the oil contained in mezga, Q_8 ;

- with moisture in the mezga, Q_9 ;

- with evaporating moisture, Q_{10} ;

- with the air coming out of the tank, Q_{11} ;

- with condensed steam on the heating floor, Q_{12} ;

- heat lost to the surroundings, Q_{13}

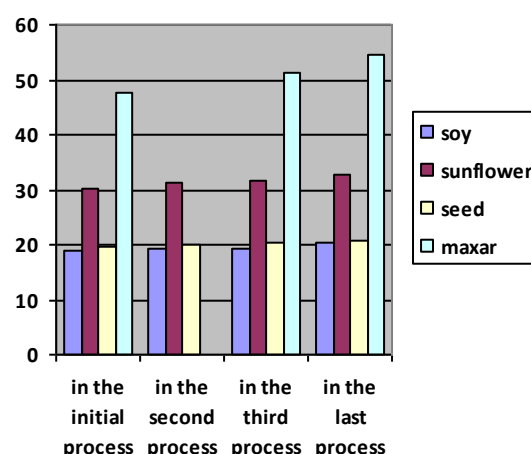
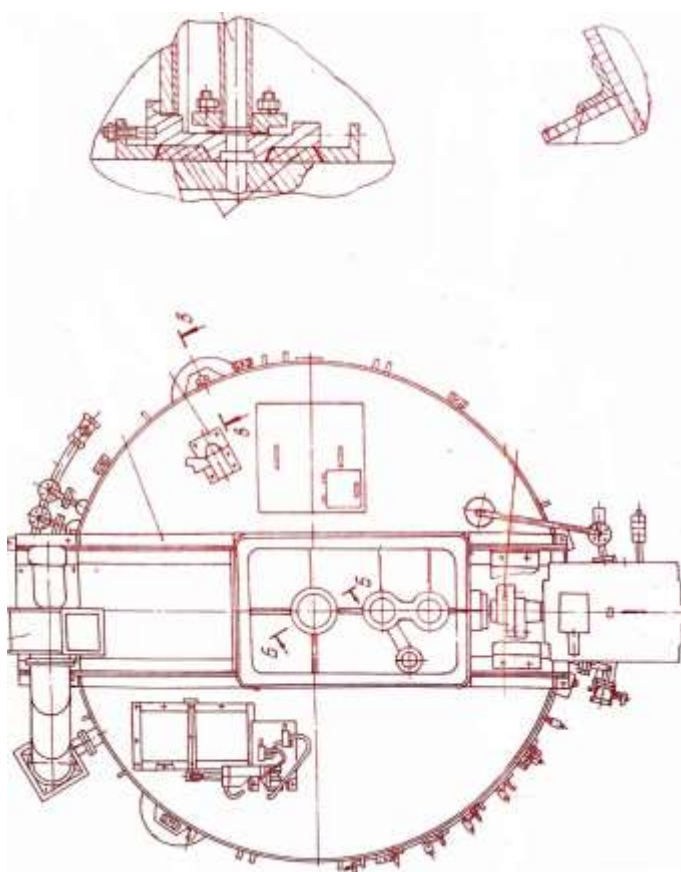


Table 3. Drum frying pan. 1- cylinder, 2- blade mixer, 3- moistening screw, 4- screw, 5, 8- pipe for air, 6- intake pipe, 7- collector, 8- electric motor, 9- mixer, 10- exhaust pipe .

Construction and operation of crucible roasters. At present, in production, frying devices with 5, 6 and 7 combs are widely used.

- with oil in the core, Q1;- with moisture in the core, Q2;
- with added moisture during soaking, Q3;
- with incoming moisture during steaming, Q4;
- with steam entering from under the hood, Q6;
- with steam supplied to the heating floor, Q7.

Heat consumption (Dj, in):

- with the oil contained in mezga, Q8;
- with moisture in the mezga, Q9;
- with evaporating moisture, Q10;
- with the air coming out of the tank, Q11;
- with condensed steam on the heating floor, Q12;
- heat lost to the surroundings, Q13

Amounts of heat entering the boiler:

1. Heat entering with the oil in the core: Q-mct

3. Heat released by evaporating steam. The steam that evaporates from the first boiler is the heat that was spent during the steaming and steaming of the core. Accordingly: $Q - (0.3w + 0.5w) I$,

Different types of oilseeds require different amounts of steam per one ton of oilseeds. For example, 175 kg of steam is used for sunflower, 175 kg for cotton seed, and 230 kg for flax.

Cast iron and steel are welded from two different materials. Caskan Fig. 25 consists of two parts: bottom 1 and cylindrical part 2, its diameter is 2000-2200 mm and height is 430-650 mm.

There is a hole under the eyebrow, and through this hole the mez passes from one eyebrow to another. A hinged cover is installed under the hole. There is a certain time for each cup of the hot pot.

After a certain time, the goods are lowered from the top to the bottom. In this case, the hinged lid opens. The hinged cover 1 is mounted on the axle 2 and can rotate freely in it.

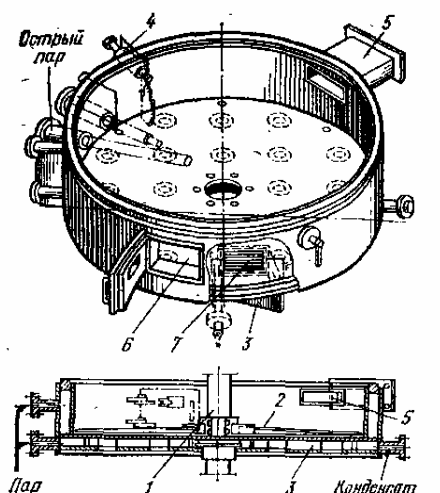
The hinged cover has 3 shielding pins attached to it, which touches the surface of the glass inside the cup. When the level of the mezna on the eyebrow rises to the specified height, the pin rises and turns the hinged cover around its axis and closes the cover.

When the level of the mezna on the lower eyebrow decreases, as a result of the top also falling down, the hinged cover is twisted and the cover opens, and the mezna begins to fall from the upper eyebrow to the lower eyebrow, and this process continues until the mezna level reaches

the specified height. The principle of operation of the link cover is the same as the joint cover, but it differs in its structural structure. The Link cover transfers the amount of falling goods in the same amount.

To ensure that the fried core does not burn, the steam spreads evenly, and the core layer is even, a three-edged blade 6 is installed on the forehead, and it is fastened to the vertical axis 5

with bolts. These knives are three-sided and are installed 5 mm from the wall of the eyebrow and 2-3 mm from the base.



A six-burner frying pan is heated by steam from under the J-6 burners. The 4 bolts are placed in such a way that the bottom part of the top bolt fits snugly into the housing of the bottom bolt. It is designed to be heated by steam with a pressure of 5 atmospheres from the bottom of the tank.

The product falls from the first bucket to the second bucket through a hinged cover. Arrowhead device 3 indicates the level of the table in the table.

There are 12 pockets on the side walls of the four hoods, from which a product sample is taken for inspection. 10 windows have been installed to enter and carry out repair work in each of the buildings.

On the sides of the lower table, two 11-piece trays are installed, and the finished table is pressed into the press. 13 suction pipes are installed to release the vapors generated from the drying of the furnace into the atmosphere.

The oil is in the form of a thin film on the top of the oil. Oil is held here due to the interaction of molecules. In order to reduce the effect of these forces, the oil is moistened, the purpose of which is to get the maximum ("max") amount of oil from the oil.

The physico-chemical properties of the fuel and the oil substances in it change when the oil is moistened and processed with heat, as a result, the "max" amount of oil is obtained.

The process of moistening and heat treatment is carried out in certain aggregate-equipment, these are moistening screws, boilers. The product after this process is called roast. Roasting is made by wet and dry method.

Heat effect. When the engine is heated, the temperature of the oil in it rises, which accelerates the movement of the oil. This leads to a reduction in viscosity. However, the viscosity decreases slightly until the temperature reaches 50-600C.

And then the decline slows down. Thus, the effect of heat is that it reduces the connection between the gel part and the oil, and allows the oil to separate and flow easily.

However, the amount of oxidizing substances increases during heating. Therefore, it is better not to increase the temperature above 1050C, to prevent the frying and oil from reacting with oxygen in the air. When heated, protein substances are denatured, moisture also has a significant effect.

During the processing of sunflower oil, the formation of non-hydratable phosphatides mainly occurs due to their hydrolysis during the process of oil frying.

The gradual heating of this process from 200C to 700C and certain humidity is the result of increased activity of hydrolytic enzymes.

For this purpose, the process of soaking and roasting sunflower oil should be reduced to 8.5 - 9.0% moisture content of sunflower oil, unlike other oilseeds.

At the beginning of roasting, the humidity is 7-9%, and the temperature is 75-850C, then it is dried to 6.5-7.5% in 3-4 ovens.

While reducing the moisture content of the product, it passes through the entire layer of the product, as if the product is fried by its own steam. This process is called steam frying.

Roasting from its own steam gives the product the necessary porosity and, under its influence, the necessary elasticity. Such a product is ready to receive oil by the pressing method, and the resulting product is called fried.

The most important issue in the process of roasting seed pulp is the transformation of gossypol. Natural (native) gossypol is extremely harmful. If such gossypol is present in oil, kunjara, or meal, their quality deteriorates.

In addition, gossypol darkens the color of oil and is the main factor in the refining process. during frying, under the influence of oxygen, moisture, heat, gossypol reacts with free amino acids, proteins and phosphatides.

The characteristics of the roast being pressed are different depending on the pressing conditions. the main requirement for roasting is its uniformity. In addition, the quality of the roast should be kept unchanged during its processing.

The roast should have a plastic and compressible structure. It is based on the principle of extracting oil from the fry in screw presses and pressing it slowly.

Due to the shortening of the pitch of the auger roll and the greater compression of the auger walls with the auger, the auger separates from the oil.

It is not only external forces that cause the oil to flow, but the resistance of the substances contained in the core to external influences is also of great importance.

in order for the roast to be plastic and uniform, it is necessary to pay attention to the uniform operation of the stirrers, the distribution of steam, and the thickness of the roast.

As the temperature and humidity increase during roasting, the activity of enzymes increases, when a certain temperature and humidity are reached, this activity reaches its highest level, and then it decreases, and finally this activity reaches its disappearance.

The conditions leading to protein denaturation reduce the activity of enzymes.

At the same time, it is possible to reduce the activity of enzymes when the temperature is 80-850 C by moistening the liquid and heating it intensively for a short time. Before roasting, it is carried out in the evaporator (prop.uvl.) screws.

Different families of oilseeds have their own enzymes, so they have been assigned "optimal" conditions (separated).

Phosphatides, which do not combine with water, are formed during the processing of pistachios when the temperature is from 200 C to 700 C.

If the reduction of activity is carried out for a short time and intensively, the formation of such phosphatides (that is, if the activity of phospholipases is lost) is reduced.

The roast should have a plastic and squishy texture. Grind the roast in screw presses

The product ripens after being exposed to hydrothermal effects.

The roast comes out of the pot with a unique structure. The roast coming out of the bottom part of the boiler is talc-like, orange in color, the temperature is 108-1100C, and the moisture content must not exceed 3.5%.

The information presented in the table was obtained from raw materials grown from local seeds at Gulistan extract oil JSC enterprise of Syrdarya region.

3. Conclusion

In conclusion, it can be said that the works aimed at increasing the efficiency of the technological processes taking place in the improvement of the efficiency of the roasting process have been thoroughly studied.

When the product is heat treated, the physico-chemical properties of the soluble gel part and the fatty substances in it have changed, as a result, the maximum amount of oil can be obtained as a result of these changes.

When the engine is heated, the temperature of the oil in it rises, which accelerates the movement of the oil.

It is well known that during the processing of roast, the formation of non-hydratable phosphatides occurs mainly due to their hydrolysis during the roasting of the roast.

As the temperature and humidity increase during the roasting process, the activity of enzymes increases.

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