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ON THE ISSUE OF TECHNOLOGY FOR DRYING OILSEEDS

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ABSTRACT

The article studies and analyzes the drying process of oilseeds. Studied grain dryers and their types, technological processes of drying seeds, as well as dryers and systems. Dryers of mine, drum, chamber and bunker recirculation types are presented. 3-table, 7- references.

KEYWORDS: ***dryer, mine grain dryer, technology, process, seeds, grain, moisture, heat exchange, air.***

INTRODUCTION

In the Republic of Uzbekistan, the main oilseeds are the seeds of cotton, sunflower, soybeans, flax, and for medicinal and technical purposes, seeds of other plants, such as almonds, seeds of various fruit and vegetable seeds. With the highest 50% of the yield, the main grain crops used for the production of vegetable oil have an increased harvest moisture and need to be dried. Only after the excess moisture has been removed from the freshly harvested grain and seed mass and brought to an optimal dry state, you can count on its subsequent processing and safety. And also to conduct technological processes for obtaining oilseeds. During drying, it is determined mainly by the temperature stability of its protein substances. The thermal conductivity of grain or seeds is 3-4 times less than the thermal conductivity of water. Exceeding the permissible temperature for heating seeds, grains causes protein coagulation. Loss of the vital and useful qualities of seeds and grain. Therefore, when drying grain and seeds of most crops, feed is heated up to 40-45°C to 50°C.

At the end of the drying stage, the seed grain is treated with cold air. A decrease in the temperature of the grain, the seed significantly weakens the intensity of respiration. At a temperature of 5 °C and below on grain with a moisture content of up to 16%, the vital activity of all components of seeds and grain has mechanisms for generating their own energy to maintain their vital activity [1,2]. There are different methods of drying, drying machines and drying systems, here are some of them: Grain dryer SZSH-6, SZSH-KA, mine modular grain dryers C-5; C-10; C-20: C-30.

This grain dryer was compared with analogs “Rofama”, M-819 (Poland), “Law” (France), “Aepoqlid” (USA) [3].

The dryer fits well into any technological line for the processing of oilseeds such as cotton, soybeans, corn, sunflower seeds.

Dryers consist of sets of transporting means, heat generators, control systems, control systems and protection of the technological process of drying oilseeds in all drying machines of the drying set, or drying systems, the same process occurs, the same requirements for the drying process. This means that it is necessary to produce an ecologically pure component and structure of vegetable oil with biological and natural natural qualities and a maximum yield of vegetable oil, a modern method and mode of drying oil seeds and grains.

Natural drying. The drying agents are wind and sun. They are used for small batches of seeds in dry, sunny weather. The seeds are spread in a layer of 10-12 cm in open areas, covered with boards or asphalt, and periodically the seeds or grain are mixed until the seeds are dried by 1.5-2.0%.

For 1 ton of seeds with this drying method, an area is required; for wheat, rye - 10 m^2, barley - 15 m^2, oats - 20 m^2, millet, peas - 12 m^2, buckwheat - 25 m^2, sunflower - 22 m2. Using this drying method, you can reduce the infestation of seed by fungi and

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bacteria. Seeds can be passed through cleaning or grading machines to speed up drying. For one pass through the air-sieve machine, the moisture content of the seeds is reduced by 1.5 - 2%.

Active ventilation with outside air without heating is used if the outside air is colder than the seeds, and its relative humidity does not exceed 75%. Air is blown through the seed mound. It is necessary to supply at least 400 m^3 of air per hour per 1 m^2 of floor. To do this, use special equipment for seed storage, stationary ventilation units SVU-1, SVU-2, SVU-3, USVU-63, airslides, mobile telescopic units TVU-2, bunkers (VB-12.5, VB-25, etc.) and other devices. The thickness of the embankment should not exceed two meters. The duration of such drying of seeds with a moisture content of up to 22% should not be more than ten days, and with a moisture content of more than 22% - six days. At the same time, the intensity of air supply also changes (Table 1) [4].

The amount of air with active ventilation of wheat seeds with different humidity (m^3 per 1 m^2 of floor for 1 hour).

1-Table

Seed moisture content, %	Drying time, %	
	6 days	10 days
18	400	230
20	550	330
22	700	420
24	800	480

The duration of drying seeds with a moisture content of 22-24% at an air temperature of 30-35 °C should not exceed 2-4 days for wheat and peas: for oats and barley 5-6 days. If the duration is longer than the specified period or the humidity of the outside air is greater than the humidity of the inter-seed space, at high temperatures the seeds absorb moisture and "steaming" occurs.

Air temperature with active ventilation of seeds of different humidity, °C. (Table 2)

2-Table

Agriculture	Seed Moisture Content, %	
	Before 22	23-26
Wheat	46-51	41-46
Rye	51-56	46-51
Barley	56-61	46-51
Oats	56-61	46-51
Peas	36-41	31-36
Buckwheat	41-46	31-36

The mound quickly develops fungi and seeds lose their germination. With active ventilation with a lower supply of heated air, the lower layers of seeds dry faster, the air is saturated with moisture rising up and cooled. At the same time, the upper layers of the seeds may not dry out, but on the contrary, they increase humidity. Therefore, controlling the moisture content of seeds and mounds, it is necessary to take samples from different depths, and determine the course of the drying process by its average values. This phenomenon must also be taken into account when unloading ventilation devices.

Drying on grain dryers significantly speeds up the process, but it is also more dangerous than active ventilation. It requires careful monitoring of the temperature of the coolant and seeds. The drying agent in this method is a mixture of air and furnace gases.

The temperature of the drying agent is from 45°C to 75°C. Drying time: 40-60 min. In order to avoid damage, the moisture content of the seeds is reduced by no more than 5-6% in one pass through the dryer. This is especially true for corn, lupine, beans, soybeans and other large-seeded plants, in which the humidity can be reduced by only 4% at a time.

SZSB-8, SZSB-4, SZSB-2, etc., less suitable for drying drum dryers. The temperature of the coolant in them is 90-130 °C, the drying time is 20-30 minutes. The high temperature of the drying agent creates a risk of damage to the seeds. Therefore, it is not recommended to use drum dryers for seeds. The drying mode depends on the type of plant and the moisture content of the seeds (Table 3).

The mode of drying seeds in mine dryers.

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3-Table

Agriculture	Seed moisture before drying, %	Number of seed passes through the dryer	Limiting temperature, °C		
			Heat carrier	Seed in the dryer	
				SZSh 16A	SZSh -16
wheat		1	70	40	45
rye	18	1	65	40	45
barley					
oats	20	1	60	40	43
	26	2	65	40	45
	higher 26	1	55	40	40
		2	60	40	43
		3	65	40	45
buckwheat millet		1	60	40	45
	18	1	55	40	45
	20	1	55	40	40
	higher 26	12	50	40	38
		3	55	40	40
			60	40	45
corn		1	60	40	45
	18	1	55	40	43
	20	1	50	40	40
	23	2	55	40	43
		3	60	40	40
Rice	Regardless of humidity	-	60	35	35

Seeds of beans, peas, corn, lupine, beans dry slowly. Small seeds of many flying grasses, cabbage, sugar beet and other plants dry quickly.

Seeds with high moisture content (more than 22%) are passed through dryers twice, or even three times. If the moisture content of the seeds is in the range of 17-20%, then one pass through the dryer is made. The coolant temperature decreases with increasing seed moisture [5].

When drying sunflower seeds in mine-type grain dryers.

When drying sunflower seeds in mine dryers, their initial cleaning from weeds is necessary, since they can lead to clogging of the dryer and its fire. Dryers of this type dry most of the seeds intended for storage. Seeds with high moisture content in such a drying apparatus can be subjected to two, and often, three times drying. In this case, the flow of processing is disrupted, which causes difficulties in working with newly arriving seeds. As a result of uneven movement along the mine sections when they are processed with hot air, the seeds are heated unevenly, the temperature difference can be up to 10 degrees. This is due to the fact that the seeds move more slowly near the walls of the mines than in the center. In addition, insufficient drying capacity of the dryer can lead to overheating of some of the seeds. To prevent this from happening, a horizontal partition, usually metal, is placed above the divider of the drying hopper located above the air distribution chamber.

Of all mine dryers for drying sunflower seeds, it is most rational to use twin dryers. They can dry seeds using different technologies, depending on their initial moisture content.

Of all the grain dryers of the mine type, use, and also eats for drying sunflower seeds, twin dryers, for example, DSP-32-Otkh2. They allow seeds to be dried according to various technological schemes, depending on the initial moisture content and the required moisture removal. So, with a relatively low initial moisture content (up to 14%), sunflower seeds can be dried in one pass according to the drying-cooling scheme. Both grain dryers operate in parallel. When the moisture content of the seeds is from 14 to 20%, it is advisable to sequentially pass the seeds through both dryers according to the drying-maturing, drying-cooling scheme (the fan of the cooling zone of the first dryer is turned off). If the moisture content of the seeds is above 20%, the cooling shaft of the first grain dryer can be used as a drying shaft by connecting it to the firebox.

It is necessary to pay attention to the fact that with insufficient throughput of the dryer, overheating of sunflower seeds can be observed. So, according to [4], even in temperature conditions of 80 and 145°C: 90 and 145°C with insufficient passage of seeds through the dryer, they were heated to a temperature of 62 and 58 °C. Conversely, under a more severe temperature regime (120 and 140 °C), sunflower seeds with an initial moisture content of 21.8% were dried 8.6% at a throughput of 15.4 t / h

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and at the same time they were heated to a temperature of 45 °C.

Various options for the reconstruction of mine direct-flow grain dryers are also given in the special literature [1,4,6].

Drying of sunflower seeds in recirculation dryers.

Recirculating grain dryers, in contrast to direct-flow ones, allow drying seeds with different moisture content in one cycle. The technology of drying seeds in recirculating dryers with heating chambers in a falling layer consists in alternating short-term heating of seeds in an ascending stream of hot air at a temperature of 250-3500C, keeping heated seeds, their cooling and recirculation. With this method, simultaneously with drying the seeds, they are also cleaned from weeds.

Drying of sunflower seeds in recirculation dryers at high temperatures has a beneficial effect on the quality indicators of sunflower oil.

When drying sunflower seeds in recirculation dryers, it is very important to evenly distribute the seeds throughout the entire section of the chamber, as well as to prevent the accumulation of oil dust in the heating chamber and eliminate the ingress of sparks from the furnace to the heating chamber, since dryers of this type are fire hazardous.

From recirculating grain dryers that do not have special heaters for heating seeds, it is advisable to use the A1-DSP-50 grain dryer.

From recirculating grain dryers that do not have special heaters for heating seeds, it is advisable to use the A1-DSP-50 grain dryer of the Karlovsky machine plant (Poltava region). This dryer can also operate as a co-current dryer, if necessary, remove up to 6% moisture. In recent years, this enterprise has produced a number of new grain dryers of a similar design with a capacity of 10, 20 pl.t / h, providing continuous drying with good technical and economic performance.

Drying out of seeds in ventilated bins.

The advantage of ventilated bins is their simplicity and long service life. Mild drying modes prevent injury to sunflower seeds.

When a large amount of wet and raw sunflower arrives in a short time, it is not always possible to dry it in a stream. In this regard, it is advisable to use various methods of increasing the resistance of freshly harvested sunflower seeds, including active ventilation. Temporary storage periods and ventilation modes are established by appropriate instructions. In the presence of sunflower seeds differing in oil content, consignments of seeds are formed according to oil content groups [6].

The technological value of sunflower seeds is determined by its oil content. Therefore, it is important to preserve the quantity and quality of the oil. During the drying process, either synthesis or decomposition of fatty components can occur. The direction of these transformations depends on the moisture content of the seeds, on the temperature and duration of their heating. Under optimal drying conditions, the oil content in sunflower seeds increases. The accompanying substances contained in the seeds pass into the oil: phosphatites, carotenoids, sterols, waxy substances.

For drying sunflower seeds, bunkers SZTs-2.5, BV-25, OBV-50, K-878, K-839, equipped with active ventilation units and equipped with two-section electric air heaters (air heaters), are used. At a relative humidity of 75 to 80%, only one of the heaters section can be switched on, and at more than 80%, the regulators connect both sections and they work simultaneously. It is possible to actively dry sunflower seeds in ventilated bunkers using air heaters VPT-600, TAU-0.75, etc. In this case, connect a canvas sleeve to two or one bunker so that 1 ton of seeds has about 500 m^3 / h of drying agent [6 , 7]

The advantage of ventilated bins is their spaciousness and accessibility. They do not require large investments and have a long service life. The use of gentle drying modes prevents injury to the seeds, which is especially important for sunflower seeds.

The disadvantages include a long drying time, significant unevenness of drying in terms of moisture between layers (different quality of seeds in terms of moisture reaches 1.5..3.5%), low productivity. To eliminate these disadvantages when drying sunflower seeds in ventilated bins, two options are used.

In the first variant, every 3.5 ..., 4.0 hours of drying (initial moisture content of seeds is 9 ... 13%), the fan is stopped, and the seeds are moved in the same hopper by releasing them for 10 ... 15 minutes, then they are moved to another bunker, where drying is continued for 3 ... 4 hours.

Modernization of dryers to reduce the fire hazard of grain dryers when drying sunflower seeds, it is necessary to: 1) prevent the accumulation of oil dust in the heating chamber and eliminate the ingress of sparks from the furnace into the heating chamber; 2) evenly distribute the seeds over the entire section of the heating chamber at the maximum load of the recirculation elevator. For this purpose, it is recommended [3,6] grain dryers to be equipped with a fireproof heating chamber of variable cross-section with brake elements in the form of cones on flexible suspensions (in heating chambers with brake elements in the form of pipes, weld two steel belts from below along each pipe at an angle of 45 (one to one) and use a two-circuit cooling scheme, install a spark arrester in the furnace of the dryer, and supply a drying agent with a temperature of 100 ± 10 °C to the recirculation shaft, thus providing a recirculation-isothermal drying mode.

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In [3] it is noted that high-temperature drying of sunflower seeds with a moisture content of 29.9% to 7% on a modernized grain dryer with double-circuit cooling at temperatures of 3040… 310°C provided heating of sunflower seeds in the range of 58… 61°C. At the same time, the acid number of the oil by 0.19 ... 0.22 mg KOH, the efficiency of the grain dryer increased from 28 to 46.5 pl.t / h, and the cost of equivalent fuel decreased by 1.2 kg. Under such conditions, 6000 tons of seeds were dried and there was not a single case of burning of the dryer or waste in the bunker.

Drying of sunflower seeds in drum dryers.

For drying sunflower seeds in the oil and fat industry, drum dryers with differentiated drying modes are used, depending on the moisture content of the seeds. The temperature of the drying agent should be the higher, the higher the moisture content of the seeds. The big disadvantages of using drum dryers are partial cracking of the husk and dehulling of seeds, low moisture removal in one pass through the dryer, and low productivity.

CONCLUSION

Drying of seeds in drum dryers occurs in a sprinkled layer of seeds when it is blown through with a drying agent. In drum dryers, the temperature of the drying agent, depending on the moisture content of the seeds and productivity, is maintained at the level of 250 ... 350°C, at the outlet of the dryer - 50 ... 80°C. The average residence time of seeds in the dryer is 14 ... 17 minutes.

In a drum dryer, drying proceeds faster than in a mine dryer, but the filling factor of the drum volume with seeds is 20 ... 25%, and therefore the amount of moisture evaporated in 1 m3 of the drum space is less than in a mine grain dryer.

Severe drying modes, different residence times of sunflower seeds in drum dryers cause uneven heating and drying, an increase in husk and acid number of fat, and increased fuel consumption.

Modernization of drum grain dryers is carried out according to various schemes [3]. One of them is to change the inner drum nozzle. The second allows you to organize a transverse blowing of the seed layer (from bottom to top) with the formation of a fluidized bed. A method for drying sunflower seeds in a pouring layer of a drum dryer with a channel nozzle is also proposed, which allows obtaining the necessary moisture removal in one pass at any initial moisture content and significantly reduced injury to the seeds.

This work investigated the technology of drying oilseeds, and the types of dryers, their varieties, the advantages and disadvantages of these dryers. The above analysis allows us to determine the degree of automation of the control of the drying process of oilseeds, the development of an algorithm for the control of each unit and the whole systems.

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