METHODS OF CALCULATING THE MAIN TECHNOLOGICAL INDICATORS OF MOBILE DRYING EQUIPMENT IN THE COTTON CLUSTER SYSTEM

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Annotation
The article recommends a dryer for drying the harvested raw cotton in the field, for the delivery of a cotton refinery to a higher class. The main tasks performed to determine the economic efficiency and the mode of operation of the drying plant are shown. The methods and definitions of the main technological indicators of the drying process in the installation are given.

Key words: textile cluster, farm, cotton variety, cotton class, cotton moisture, cotton dirt, standard value of moisture by classes, drying equipment

Аннотация:
Мақолада терилган пахтани, пахта тозалаш корхоналарига юқори синфларга топшириш учун, дала шароитида кичик пахта етиштирувчи хўжаликлар учун қуритиш ускунаси тавфсия этилган. Ускунанинг иқтисодий самарадорлиги ва ишлаш режимларини аниқлаш учун амалга оширилиши керак булган вазифалар кўрсатилган. Қуриш жараёнининг асосий технологик кўрсатгичларини ҳисоблаш усуллари келтирилган.

Калит сўзлар: тўқимачилик кластери, фермер хўжалиги, пахта нави, пахта синфи, пахта намлиги, пахта ифлослиги, синфлари бўйича намликнинг меьёрий қиймати, қуритиш ускунаси.

Аннотация:
В статье рекомендована сушильная установка для сушки собранного хлопка сырца в полевых условиях, для сдачи хлопка-очистительный завод на более высокий класс. Показана основные выполняемые задачи для определения экономической эффективности и режим работы сушильной установки. Приведены методы и определения основные технологические показатели процесса сушки в установке.
Ключевые слова: текстильный кластер, хозяйство, сорт хлопка, класс хлопка, влажность хлопка, хлопковая грязь, нормативное значение влажности по классам, сушильное оборудование.

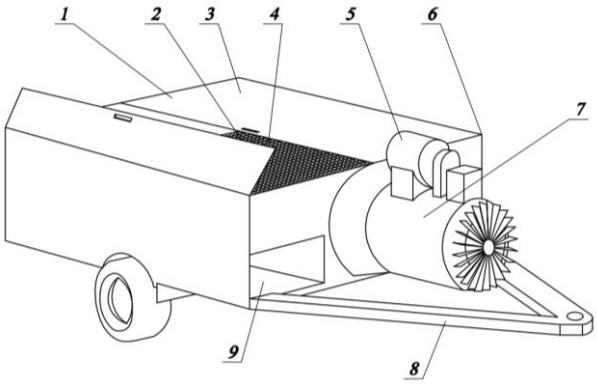
The growing popularity of the textile cluster in our republic requires reconsideration of the economic situation of cotton and textile enterprises. It is known that by the present time, as a result of a sharp increase in electricity, fuel, and monthly salaries, their share of costs in production, that is, their share in the cost of products, has increased. Including mineral fertilizers, fuel and equipment costs in cotton cultivation, cotton picking have a negative impact on the annual income of farms. Reducing the cost of growing and selling cotton, increasing the purchase price of cotton are the main factors for increasing the profitability of the farm. The analysis of the current situation in farms shows that there is an opportunity to increase the purchase price of cotton.

It is known that picked cotton is delivered to the cotton ginning enterprise by classes depending on industrial grade, moisture and dirtiness, and the purchase price is determined based on these. If the moisture and dirtiness of cotton is higher than the standards set by class, the purchase price paid for cotton is paid with a discount of 0.5 percent for each percentage of dirtiness and moisture exceeding the standard [1] in addition, funds for cotton cleaning and drying are provided to the cotton ginning enterprise according to the standards set. will be paid.

Although there is an opportunity to reduce the pollution of cotton by picking clean cotton, there is a problem of reducing the moisture content of cotton and adapting it to high class standards. Recommendations for solving this problem are developed in the article.

It is known that excess moisture of cotton is mostly due to dew, excess moisture is only in mechanical contact with cotton, it is not difficult to separate this moisture. To carry out this process in cotton farms, picked cotton is dried in threshing machines. If the drying process is carried out in this way, the additional contamination of the cotton, the active combination of impurities with the fiber, i.e., the increase in the strength of the connection with the fiber, as a result of the difficulty of cleaning the cotton from impurities, this drying method was abandoned.

Mobile drying equipment is recommended to solve the problem in field conditions, in the farm area. It is attached to a moving mechanism in the form of a trailer and is transported from field to field. The scheme of the mobile drying equipment is shown in Fig. 1. The drying equipment consists of a rectangular drying chamber 1 with sides a and b, and cotton is placed on a mesh surface at a height h. Hot air is supplied to the equipment using a heat generator 6 and a fan 5. The supplied hot air passes through the mesh surface through the chamber 9 and dries the cotton layer. The drying chamber cover 3 is opened, cotton is loaded into the drying chamber, and the dried cotton is taken out. Due to the air resistance of the cotton layer and mesh surface, a certain level of air pressure is generated in the hot air chamber 9, which ensures uniformity of the air speed along the surface of the cotton layer.



1-drying chamber; 2-mesh surface; 3-drying chamber cover; 4-drying chamber box; 5th fan; 6-heat generator; 7th electric motor; trailer 8; 9-hot air chamber;

To determine the economic efficiency of the proposed mobile drying equipment and to choose its optimal modes, it is necessary to solve the following tasks:

- determining the geometric dimensions of the drying equipment that ensures the required cotton quantity and moisture separation, ensuring the ease of movement of the mobile drying equipment on roads and cotton fields;
- drying modes, air consumption, drying agent temperature, drying cotton layer height, drying time, which ensure even and fast drying of cotton;
-economically based source of hot air development hot air generator (electric, gas, liquid fuel) and fan selection.
- development of cotton drying regimes based on experience, which separates the amount of moisture required for sale in higher classes to cotton ginning enterprises depending on cotton varieties and their initial varieties;
- conducting experimental testing of drying equipment under production conditions. Carrying out a comparative economic calculation with the current situation, justifying its economic efficiency.
- to determine the temperature of hot air that ensures the full preservation of the quality indicators of cotton. In researches [2,3], taking into account the fact that yellow spots appear on the fiber when the heating temperature of cotton fiber is 700C, the drying temperature of the existing equipment was chosen as 600C.
-to determine the speed of drying, drying to what moisture level, and duration of drying to solve the problem of fast and high-quality drying of cotton.

The amount of moisture (ΔW) that should be removed during drying of cotton is determined as follows

$$\Delta W=W_б-W_м$$

in this $W_б$- initial moisture content of cotton, %; $W_м$- standard value of moisture by classes depending on the type of cotton.

The standard value of cotton moisture can be obtained from the table below for cotton varieties and classes [1].

1-table By cotton variety and classes $W_м$- maximum values of

Cotton variety	By cotton variety and classes $W_м$- maximum values of		
	1	2	3
I	9,0	12,0	14,0
II	10,0	13,0	16,0
III	11,0	15,0	18,0
IV	13,0	17,0	20,0
V	-	-	22,0

Based on the initial moisture content of the cotton, the amount of moisture to be extracted ΔW is determined using Table 1.

It is known that because cotton dries in a constant speed period and in a decreasing speed period, its speed is not the same during the drying process. Usually the build speed and time are calculated separately for the constant speed period and the decreasing speed period [4]. But this leads to a number of difficulties, including the need to determine the coefficients of construction, critical moisture content in the period of constant and decreasing speed.

B.S. Sajin and a number of researchers [5,6] developed a new method for calculating the building process, in which the building process is represented by a single kinetic equation.

All parameters included in the kinetic equation are determined on the basis of a single kinetic curve, it is not required to determine the temperature changes of the drying agent and the drying material during the construction process. The drying rate coefficient is constant during the constant and decreasing rate periods, while the building rate variation is calculated using the driving forces of the building process. In addition, the coefficient of drying speed takes into account the structural, sorption, thermal, physical and physico-chemical properties of the material being dried.

The generalized drying equation is expressed as follows [5,6]

$$G\frac{dU}{d\tau} = k(U_H - U)(U - B) \qquad (1)$$

in this G- of the working surface of the drying equipment 1 м^2 ha suitable cotton mass; k- drying rate coefficient; U_H- initial moisture content of cotton; U- moisture retention of cotton at a certain time; B- moisture content in balance corresponding to air parameters at the end of cotton drying.

Cotton moisture retention (U) and construction time (τ) are determined from equation (1).

$$W = \frac{2U_H - B + B..e^{\frac{2k(W_H - B)\tau}{G}}}{U_H + e^{\frac{2k(W_H - B)\tau}{G}}} \qquad (2)$$

$$\tau = \frac{G}{2k(W_м - B)} ln \frac{2W_H - B - W}{W - B} \quad (3)$$

To determine the setting time based on the initial moisture content of the cotton, instead of W, the value of W_m is taken from Table 1.

The value of moisture retention in equilibrium is determined using the sorption-desorption isotherm of cotton depending on the temperature and relative humidity after hot air drying.

Cotton drying rate coefficient K can be determined by the following formula [7].

$$K = \frac{\sum_{i=1}^{N} P_i^2}{(W_H - B)\sum_{i=1}^{N} \tau_i p_i} \quad (7)$$

in this $p_i = ln \frac{2W_H - B - W_i}{W_i - B}$;

in this W_i, τ_I - experimental values of humidity and build time, respectively; N-the number of experimental values;

Therefore, it is possible to conduct experimental tests to determine the construction time of wet cotton depending on the cotton type, class, and initial moisture content, and determine the construction time using the obtained experimental results.

It should be noted that the cotton layer height, air consumption, and its speed in the cotton layer affect the drying time of cotton to the required moisture content W_m.

The required hot air consumption for drying cotton is determined as follows.

$$L = F \cdot f \cdot v = a \cdot b \cdot f \cdot v \quad (5)$$

Efficiency of drying equipment

$$Q = \frac{m}{\tau} \cdot 60 = \frac{a \cdot b \cdot h \cdot \rho}{\tau} \cdot 60 \quad (6)$$

in this $F = a \cdot b$- drying chamber cross-sectional surface;

$f = \frac{F\tau}{a \cdot l}$- Mesh surface ratio is a coefficient characterizing the surface area of pores (Fτ- the total surface of the holes; v- the amount of hot air entering through the mesh surface opening; τ- drying time; ρ- cotton density).

Therefore, the efficiency of the drying equipment and the amount of hot air depend on the density of the surface of the drying chamber as well as the air speed.

The speed of hot air supplied to the cotton layer for drying is important. The air velocity should not break through the cotton layer at certain points and create air channels.

Otherwise, it will cause the cotton to dry unevenly and the rate of drying will decrease. Its value is selected on the basis of experience, taking into account ensuring uniform drying of the cotton layer.

It should be noted that when drying cotton in a layer, the air speed varies along the surface of the layer, its temperature and relative humidity change along the height of the layer, which leads to construction unevenness due to the unevenness of the layer. Therefore, during the drying process of cotton in the recommended drying equipment, it is necessary to mix it several times depending on the initial moisture content.

Summary

1. A scheme of cotton drying equipment for farms is recommended and its demand has been demonstrated.
2. The issues that need to be solved for the design and implementation of the drying equipment are determined.
3. Formulas for determining cotton drying time and drying equipment performance on cotton were recommended.
4. In order to determine the economic efficiency of the drying equipment and to put it into practice, it was shown that large-scale experimental tests should be conducted.

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