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MODELING OF THE DRYING PROCESS IN THE STAGE DURING THE PERIOD OF FALLING SPEED

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ABSTRACT
The article discusses indirect methods based on various physical properties of materials. The most common conductometric, based on the resistivity of cotton samples, dielectric based on the dielectric properties of cotton, with a change in humidity, the electrical capacitance of the sensor with the sample changes, which is recorded by a secondary device and the humidity is determined using a special scale. But these methods, along with the simplicity of design and speed of operation, are unsuitable for cotton materials in mutual settlements due to the large measurement error (more than 0.5% abs at humidity up to 10% and more than 5.0% relative at humidity more than 10%), but they can be used to control technological processes of drying, cleaning and moistening of raw cotton and fiber.

Keywords: cotton, moisture, device, mass ratio of moisture, devices, error, automated device

Introduction

Uzbekistan, having rich experience in growing cotton, occupies a leading position (in terms of area of cotton fields, production volumes, yields) in the top ten cotton-growing countries. In terms of intellectual potential (breeding of high-yielding varieties of cotton, created and implemented agricultural technologies, production of resources for cotton growing) and fiber quality, it is among the top five countries.

New economic systems in our republic, including large-scale construction of a textile cluster, the task of producing high-quality finished products that ensure competitiveness in the world market, and cotton gins, which are considered the main raw materials, highlight the number of requirements for cotton gins. One of the main requirements is to improve the quality and quantity of cotton fiber, which can only be increased through the development of modern technologies and techniques, taking into account the achievements and experience of cost-effective cotton-growing countries.

The cotton complex occupies a central place in the economy of the Republic of Uzbekistan. The reforms implemented by the government in the cotton industry were an essential element of the country's development and its transition to a market economy. The main products of the agro-industrial complex are raw cotton and its processed products; grain and its processed products; milk and dairy products and much more [1].

To determine the mass of conditioning during the acceptance of cotton grown by farms, it is required to determine the mass ratio of moisture by the express method. Prompt and reliable information on cotton moisture makes it possible to take the necessary measures to improve the quality of cotton supplied by farms during harvesting, and when clarifying mutual settlements, payment for the supplied cotton is made in accordance with its quality.

In accordance with the Resolution of the President of the Republic of Uzbekistan dated November 28. 2017 № 3408 "On measures to radically improve the management system of the cotton industry" [2] comprehensive measures are being taken to increase the competitiveness of products.

In order to determine the conditioned mass when receiving cotton grown by farms, it is necessary to quickly determine the mass ratio of moisture. Quick and reliable information on the moisture content of cotton allows to take the necessary measures to improve the quality of cotton delivered by farms during the harvest, and clarifies the mutual payment for the delivered cotton according to its quality. During long-term storage of raw cotton with high humidity, the structural, mechanical and biological properties of the fiber deteriorate due to spontaneous heating, which creates favorable conditions for the growth of microorganisms, their vital activity leads to deterioration of the natural properties of cotton. This, in turn, has a positive impact on the economic performance of the ginnery.

Development Experimental studies of the mechanism of moisture movement under the influence of a temperature gradient in one form or another are of great interest. Such studies for some materials were carried out by [3]. According to the experiments, it was found that moisture in the form of a liquid moves in the direction of the heat flow. In capillary-porous media, to which raw cotton with the given thermophysical parameters is close, the drying process is complicated by the phenomenon of thermal sliding, which significantly affects the mechanism of heat and moisture movement. At the same time, for wet materials with a significant temperature gradient, moist air circulates in the pores of the material, and the wall moist air is enriched with steam, and the moist air near the capillary axis (wet fibers) becomes drier, which may cause the fibers to dry out.

In the presence of two connected capillaries corresponding, for example, to the formation of a fiber and core system, the circulation of moist air in them causes a gradual increase in relative humidity. what can change the picture of humidity changes over time. Thus, in a narrow capillary (near the contact of fibers with seeds), the humidity of the air increases, in a wide capillary (in the area of the occupied fibrous medium) it decreases, as a result of which steam condensation will occur near the area of contact of fibers with seeds, and evaporation will occur in the fibrous medium itself, i.e. moisture redistribution occurs in each of these areas of the system "fiber–seeds" These patterns in a certain sense establishes the mechanism of drying capillary-porous bodies, where the movement of moisture under hard regimes differs

significantly from the mechanism of moisture movement under soft regimes, since the presence of a temperature gradient inside the raw material has a significant effect. Fig.1 show graphical dependences of moisture changes (in percent) in a layer of raw cotton from time to time obtained experimentally.

From the analysis of the curve, it follows that moisture reduction at the initial moment of time there is an intense decrease in moisture, until steam condensation occurs at the points of contact of fibers with seeds, then the drying process takes place in accordance with the average values of the thermophysical parameters of the raw-cotton.

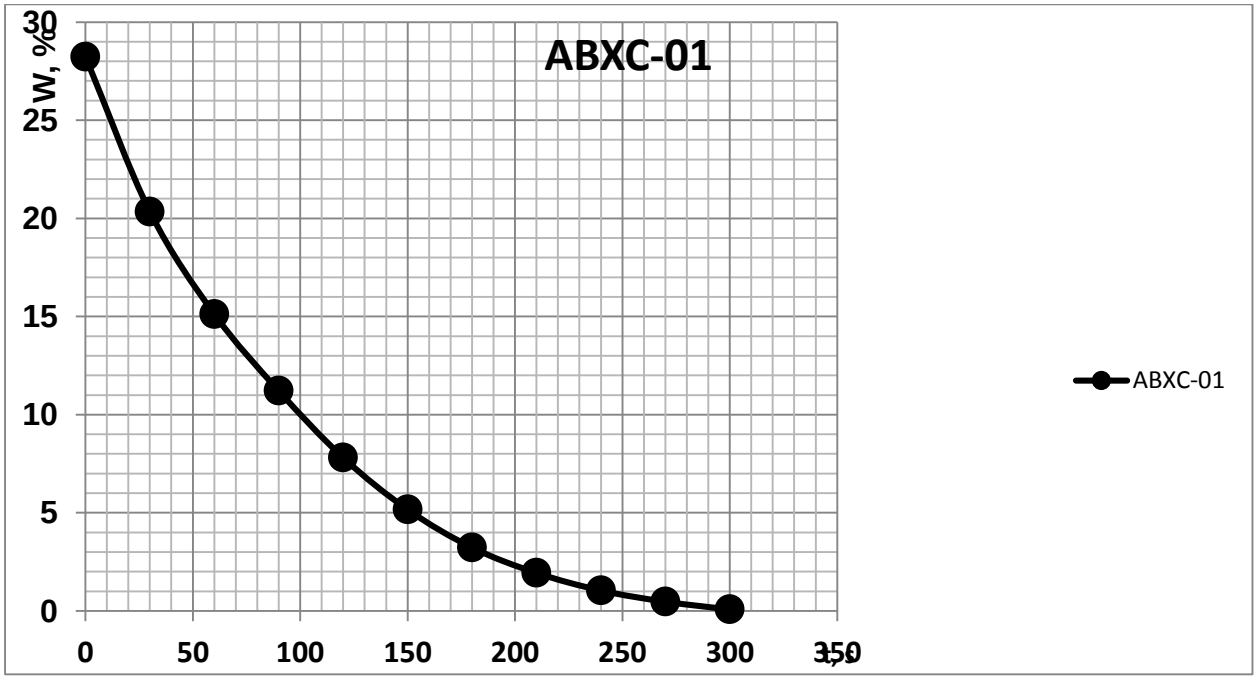
The experimental dependences are approximated by a curve of the form

$$W = W_p - (W_p - W_0)\exp(-ct) \qquad (1)$$

W_0 and W_p initial and equilibrium moisture content of raw material, accordance with the experimental data, it is accepted. To approximate the experimental curve shown in fig. 1 received $W_0 = 9.32$ and

$$W_p = 0.35,\ c = 0.0128$$

In fig. 1, the dependence graphs according $W = W(t)$ to formula (1) are represented by curve 1b.



Picture 1

It can be seen that with the help of formula (1), with known experimental data, and with sufficiently high accuracy, it is possible to describe the process of drying raw materials without taking into account the phenomenon of steam condensation

associated with the heat exchange of fibers with seeds. The function C (e) satisfies the drying equation presented in (1)

$$\frac{dW}{dt} = -c(W - W_p)$$

where is the proportionality coefficient, called the drying coefficient, determined by the formula

$$K = \frac{N}{(W_{k,n} - W_p)}$$

- N- drying speed during a constant speed period.
- $W_{k,n}$ critical humidity. for example (1), for an aluminum plate,
- $W_p = 3\%$ the reduced critical humidity,
- $W_{k,1} = 27\%$ from the drying curve we get $K = 0.165(1/\text{час})$

At the same time, in the initial impact ($0 < t <_0$) of the heat flow, the raw material is heated, after which the impact of the flow is transferred to an increased proportion of the separated mass from the mass of seeds, which leads to a pronounced “fiber-seed” structure. As is known, the saturation time is quite short, and therefore it is possible to ignore the interval of this time and take into account the process of steam release from the fiber-seed mixture.

Conclusion

As experimental data show, the heating time is quite short, and therefore it is possible to ignore the interval of this time and consider the process of steam extraction from the fiber-seed mixture" Methods for determining the moisture content of cotton differ in their speed, but the relative measurement error is 10%. According to the current regulatory documents, the error in calculations and reports on the determination of the conditioned cotton mass should not exceed 10% of the relative error at humidity up to 0.5 percent, and at humidity more than 10 percent - 5% of the relative error. Therefore, in the field of cotton cleaning, the thermometric method of direct determination of humidity with a high degree of accuracy is widely used.

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