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STUDY OF THE INFLUENCE OF DRYING AGENT TEMPERATURE ON RAW COTTON AND ITS COMPONENTS

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Annotation. The fiber heating temperature was studied during the drying of raw cotton selection S-6524 with a humidity of 10.5% and 15.2% in a 2SB-10 drying drum at temperatures of 100 °C, 150 °C and 200 °C with a capacity of 7 t/hour and 10 t/hour. It was established that the heating temperature of cotton fiber increased after passing raw cotton with a moisture content of 10.5% and 15.2% and a productivity of 7 t/h in a drum dryer at temperatures of 100 °C, 150 °C and 200 °C.

When transporting dried raw cotton with air through a pipeline in a UCC unit, cleaning raw cotton in the unit itself, and transporting purified raw cotton with air through a pipeline into a gin, the temperature of the fiber in the gin is reduced due to cooling of the raw cotton during its transportation with air. At the same time, fiber from raw cotton with a moisture content of 10.5% was cooled to 24 °C, 29 °C and 37 °C, respectively, and fiber from raw cotton with a moisture content of 15.2% was cooled to 18 °C, 23 °C and 29 °C, respectively.

When drying raw cotton with a moisture content of 10.5% and 15.2% in a drum at temperatures: 100 °C, 150 °C and 200 °C with a capacity of 10 tons/hour, the heating temperature of the fiber in raw cotton was increased. When the dried cotton is processed and transported into the gin by air, the heating temperature of the fiber in the gin is reduced by cooling the cotton. At the same time, the fiber in raw cotton with a moisture content of 10.5% is cooled to 16 °C, 24 °C and 31 °C, respectively, and the fiber in raw cotton with a moisture content of 15.2% is cooled to 14 °C, 17 °C and 22 °C, respectively.

As a result of research, it was determined that the duration of fiber cooling in raw cotton with high moisture content is lower than the duration of fiber cooling in raw cotton with low moisture content. It has been established that when increasing the productivity of machines, it is necessary to consider the process of heat transfer of fiber in raw cotton.

Keywords: Dryer drum, cotton gin, gin patch, drying agent, heat exchange, temperature, cotton, fiber, productivity.

Introduction. Warming of cotton in the initial processing of cotton has a great effect on the cleaning of cotton, effective separation of small impurities from its content, and on cotton ginning, productivity, increase of fiber and seed quality [1].

It is known that the processes of heat-mass exchange in cotton and its components mainly start from the period of mutual meeting of cotton with a heat agent in the drying drum. During the preliminary treatment of cotton raw materials after the

drying process, when cotton is transported in a pipe using air and due to external influences, mass exchange phenomena occur in cotton and its components due to changes in the heat-moisture state, and the cotton reaches the cleaning and ginning processes at temperatures that are changed compared to the heating temperature after drying. [2].

In a number of scientific studies, theoretical and practical studies have been conducted on the effective use of the heat agent for drying by improving cotton drying

techniques and technologies, reducing fuel consumption, increasing work productivity, and maintaining the natural quality indicators of the product. [3-8].

Cotton raw material consists mainly of fiber and seed, and during the drying process of cotton, the fiber quickly absorbs heat and quickly releases it under the influence of the environment. The seed is the opposite, and during the drying process of cotton, the degree of absorption of heat is realized gradually. Therefore, there is a difference between the heating temperature of the fiber and the seed, and if the moisture content of the initial cotton is high, then the difference between the heating temperature of the fiber and the heating temperature of the seed is large, and the construction process of the seed is several times slower than that of the fiber. Therefore, the drying drum performance can change depending on the temperature of the drying agent, the thermal state of the cotton raw material and its components. In order to study this situation, experimental work was carried out on S-6524 selected cottons at the cotton ginning enterprise of "APK Boka" LLC. Experiments were carried out in a 2CB-10 drying drum. Based on the coordinated technology of initial processing of cotton, in order to effectively separate large and mainly small impurities from cotton after the drying process, cotton

with an average moisture content of 11% should be transferred to the technology at an average rate of 10 t/h, and after the drying process, small impurities should be removed from cotton due to the prevention of blockages in the UXK unit and better spreading of the cotton. for effective separation, it is recommended to transfer 5 t/s from each of the two-row UXK units in the technology. Cottons with an average moisture content of 16% are given to the technology in an average amount of 7 t/h, and after the drying process, 3.5 t/h of each UXK aggregate is recorded [9]. Taking this into account, 10 t per hour of cotton with an average moisture content of 10.5% and 7 t per hour of cotton with a moisture content of 15.2% per drying drum. given The average temperature of cotton with a moisture content of 10.5% was 11⁰C, and the temperature of cotton with a moisture content of 15.2% was 12.4 ⁰C.

It was noted by the researchers that the use of drying agent at a temperature of 200⁰C and higher in the drying drum leads to a change in the quality and quantity of fiber, while the use of a drying agent of 100⁰C can preserve the quality of fiber to the maximum [10]. With this in mind, experiments were carried out with drying agent sizes of high level 200⁰C and low level 100⁰C.

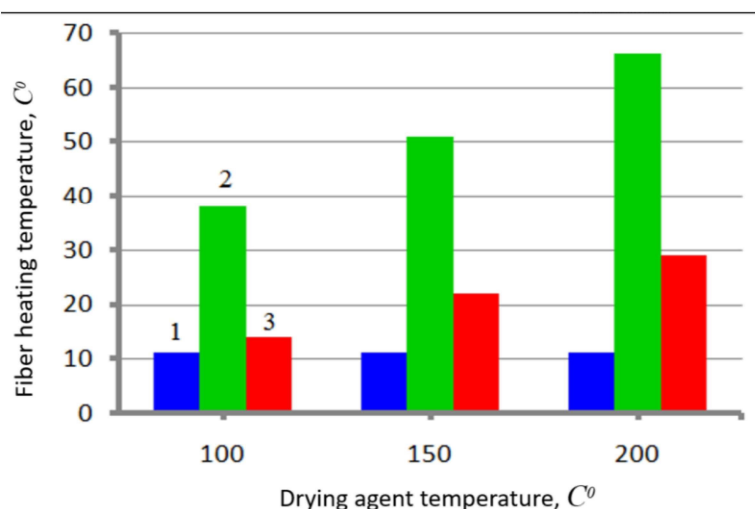


Figure 1. Changes in fiber temperature during processing of raw cotton ($W_H=10,5\%$, $Q=7t/h$)

When cotton with an average initial moisture content of 10.5% and an average temperature of 11°C was supplied to the technology in an amount of 7 t/h and dried in a drying drum at temperatures of 100°C, 150°C and 200°C of the drying agent, the heating temperature of the cotton fiber was 38°C, 51°C and 66°C, respectively (figure 1).

After the drying drum, when the dried cotton is transported through the pipeline to the UXK unit, which cleans the cotton from small and large impurities with the help of air, and when the cotton is cleaned in the

unit and transported through the pipe to the ginning machine with the help of air, the heating temperature of the cotton fiber in the saw mill decreased to 140C, 220C, and 290C, respectively.

Initial humidity is average

When raw cotton with 15.2% and an average temperature of 12.4°C was supplied to the technology in the amount of 7 t/h and dried in the drying drum at temperatures of 100°C, 150°C and 200°C, the heating temperature of cotton fiber was equal to 36°C, 47°C and 60°C, respectively (Figure 2).

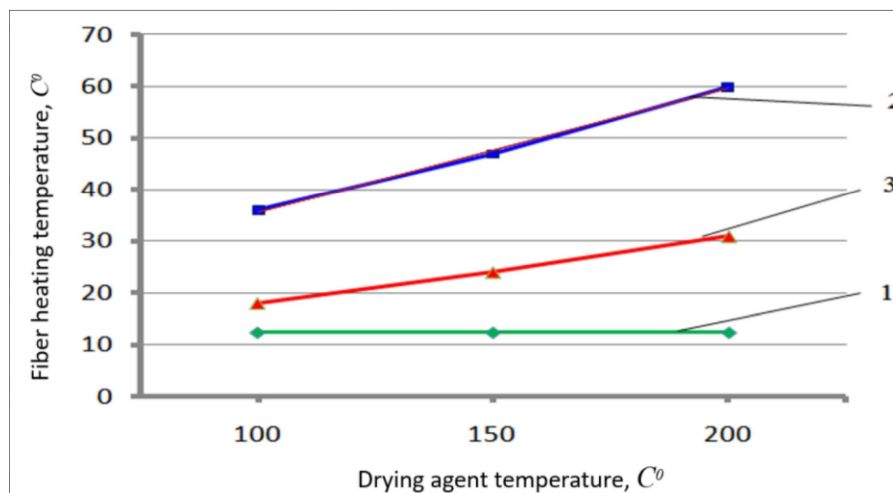


Figure 2. Changes in fiber temperature during processing of raw cotton ($W_H=15,2\%$, $Q=7$ t/h)

When the dried cotton was transported by air through the pipe to the UXK unit, after cleaning in the unit, when it was transported to the saw gin using air, the heating temperature of the fiber in the gin decreased and was 18°C, 24°C and 31°C, respectively. If we compare the fiber heating temperatures of raw cotton with initial moisture content of 10.5% before ginning, with the results of heating temperatures of cotton fiber with initial moisture content of 15.2%, the fiber of cotton raw material with initial moisture content of 10.5% is up to 24°C, 29°C and 37°C, respectively. when cooled, we can

see that the raw cotton fiber with initial moisture content of 15.2% cooled to 18°C, 23°C and 29°C, respectively. In order to study how this situation occurs when the drying drum works at high efficiency, the technology was given 10 t/h of 1st grade 2nd grade cotton with an average initial moisture content of 10.5%, and the drying agent was sent to the drum at temperatures of 100°C, 150°C and 200°C. In this case, the heating temperature of the dried cotton fiber was 35°C, 46°C and 59°C according to the drying agent supplied to the drum (Fig. 3).

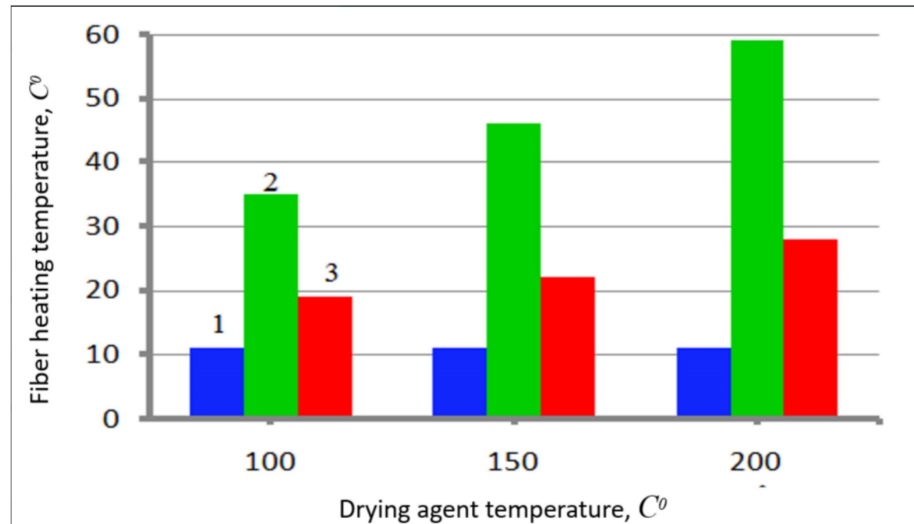


Figure 3. Changes in fiber temperature during processing of raw cotton ($W_H=10,5\%$, $Q=10t/h$)

When the dried cotton from the drum is transported through a pipe to the UXK unit, which cleans cotton from small and large impurities using air, and when the cleaned cotton in the unit is transported to the ginning machine through a pipe using air, the heating temperature of the cotton fiber in the sawed gin machine decreases and is equal to 19°C, 22°C and 28°C, respectively it happened.

When raw cotton with an average initial moisture content of 15.2% was fed to

the drying drum in the amount of 10 t/h and dried in the drum at temperatures of 100°C, 150°C and 200°C, the heating temperature of the cotton fiber was equal to 32°C, 40°C and 51°C, respectively (Fig.4). When the dried cotton was transported by air through a pipe to the UXK unit, after cleaning in the unit, when it was transported to the saw gin through the pipe using air, the heating temperature of the fiber in the gin decreased and was 18°C, 23°C and 29°C, respectively.

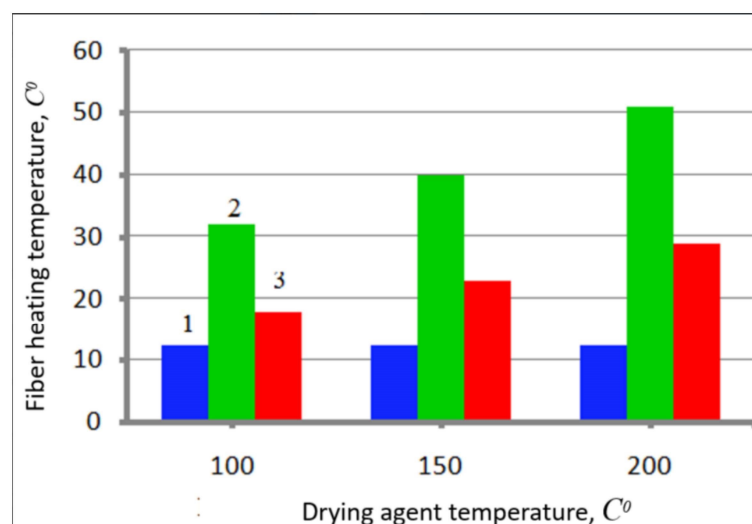


Figure 4. Changes in fiber temperature during processing of raw cotton ($W_H=15,2\%$, $Q=10 t/h$)

If we compare the fiber heating temperatures of cotton raw material with

initial moisture content of 10.5% before sawing ginning with the results of heating

temperatures of cotton fiber with initial moisture content of 15.2%, the fiber of cotton raw material with initial moisture content of 10.5% is up to 16°C, 24°C and 31°C, respectively. and the raw cotton fiber with initial moisture content of 15.2% cooled to 14°C, 17°C and 22°C, respectively.

It can be seen that the cooling duration of raw cotton fiber with high moisture content was lower than the

cooling duration of cotton fiber with low moisture content. Based on this, it was determined that the heating level of cotton raw materials with high moisture content is lower than the heating level of cotton raw materials with relatively low moisture content, and it was studied that the cooling process, like the heating process, is carried out based on the law of heat-mass exchange of cotton raw materials and its components.

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