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STUDY OF EFFECT OF DRYING AGENT COMPONENT ON CLEANING EFFICIENCY

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Abstract: It was determined that the change in the speed and temperature of the air supplied to drying significantly affects the change in the cleaning efficiency of the cotton cleaning equipment. Cotton with an initial moisture content of 9.5% and impurities of 5.4% at air temperatures of 120 and 140 °C, 2.5; 4.0; After drying at speeds of 5.5 and 7.0 m/sec, the cleaning efficiency of the equipment is 29.3; 32.5; 35.2; 40.1% and 32.1%; 34.6; 38.4; showed an increase to 41.5%. The cleaning efficiency of the equipment is 35.1 when the cotton is dried and cleaned after the temperature rises to 160 and 180 °C without changing the air speed; 37.6; 44.2; 46.8 and 38.2; 41.2; 46.4; It showed an increase to 52.5%. Cotton with an initial moisture content of 11.3% and impurities of 6.2% at air temperatures of 120 and 140 °C, 2.5; 4.0; After drying at the speed of 5.5 and 7.0 m/sec, the cleaning efficiency of the equipment is 27.4; 30.3; 33.1; 37.9 % and 34.8; 38.2; 41.5; showed an increase to 43.1%. The cleaning efficiency of the equipment is 36.6 when the cotton is dried and cleaned in the equipment when its temperature rises to 160 and 180 °C without changing the air speed; 39.6; 45.3; 51.4 % and 40.2; 42.8; It showed an increase to 53.6 and 61.7%.

Keywords: cotton, fiber, moisture, dirt, temperature, speed, time, quantity, cleaning efficiency, quality.

Introduction. According to the world experience, large-scale scientific and research work is being carried out to improve the technique and technology of the initial processing of cotton. In this field, tasks are being set, including the development of effective technologies for drying and cleaning cotton from impurities, and the creation of resource-efficient and effective equipment for drying and cleaning cotton. At each stage of production, identify the factors that have a negative effect on the quality and quantity of the product and provide technical solutions to eliminate them, maintain the initial quality indicators during the cotton drying process, reduce fuel consumption in the process, manage the product quality. it is becoming important to carry out scientific research in the direction of the development of technologies, optimization of operating modes and indicators. Separation of moisture in cotton is carried out in drying equipment. The main part of the cotton grown in our republic is 75-80% of high quality cotton. Therefore, drying-cleaning equipment was created based on scientific research carried out in recent years. This equipment is mainly designed for drying and cleaning of high quality cotton with low moisture content up to 2-3%. The optimal condition for drying the moisture content of cotton is considered to be the degree of cotton dryness, increasing its contact with the heat agent used for drying and increasing the coefficient of use of the heat agent [1].

The cleaning efficiency, productivity, quantity and quality of the equipment in cotton ginning enterprises, first of all, the operation of the equipment based on the technical requirements, the interaction with the cotton in the separation of moisture and dirt from the movable and immovable working parts of the equipment. depends on the driving forces, and secondly, it depends on the amount of moisture and dirt, which are the initial parameters of the cotton given to the technology [2,3].

Level of study of the problem.

Local equipment and technologies in cotton ginning enterprises are equipped and used on the basis of "Coordinated technology of primary processing of cotton" - PDI70-2017 [4]. The effectiveness of technology equipment in cleaning cotton depends on the condition of the equipment, along with the humidity and temperature of the cleaned cotton, the amount of large and mainly small impurities in the cotton and their adhesion to the cotton fiber [5]. Since large impurities in cotton are located in the upper part of the fiber, there are no problems in separating them from cotton in the cleaning technology. In order to separate the small impurities in the cotton, it is necessary to dry it with the help of hot air at the required speed to bring its moisture to the standard moisture, taking into account the initial moisture content of the cotton [5, 6]. In order to effectively separate small impurities from the cotton content, it is necessary to supply the cotton in a uniform manner [6-8] and to apply the mesh surfaces with the piled drums in the equipment to the moving cotton with the required amount of force [9].

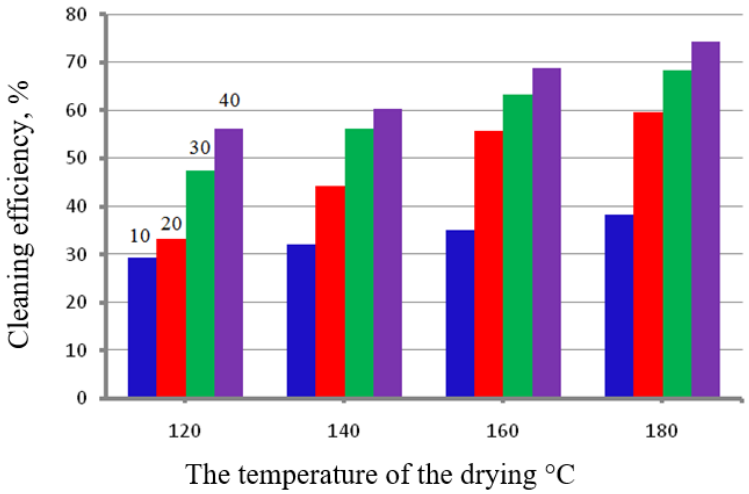
In the foreign cotton drying technology, moisture content is separated as a result of movement of wet cotton with hot air in cotton drying towers. During the cleaning process, high efficiency was achieved as a result of moving the cotton with a heat agent and the raw materials were mixed with the working parts of the cleaner [10].

Local researchers have theoretically analyzed the process of heat exchange between the cotton moving in the screw cleaner and the drying agent and determined the amount of heat used to evaporate the moisture of the cotton moving in the screw cleaner [11]. Also, the influence of the speed and temperature of the drying agent used for drying cotton on the temperature of the cotton fiber and the evaporation of cotton moisture [12], the effect of the temperature and speed of the drying agent on the cleaning efficiency of the equipment was determined, and the drying modes of high-quality low-moisture cotton were selected in the screw cleaner. [13].

Methodology. Studies were conducted on the effect of changing the temperature, speed and drying time of the heating agent for drying cotton on the cleaning efficiency of the equipment. In the researches, hot air was supplied to the cleaning equipment and changes in its temperature and speed in different amounts of cleaning efficiency were studied. Hot air temperature was determined by contact thermometers. The speed was determined in anonometer. After the temperature and speed of hot air were adjusted, cotton was transferred to the equipment and research was carried out. To increase the accuracy of the experiments, each experiment was performed in 3 repetitions.

The research work was carried out on S-6524 selected cottons with an average moisture content of 9.5%, dirtiness of 5.4% and moisture content of 11.3%, dirtiness of 6.2% [14-16]. To determine the amount of moisture and impurities in cotton, the methods specified in the state standards of UzDSt were used. The results of the conducted research are presented in the form of a histogram in pictures 1÷4.

Experimental test results. From picture 1, if the humidity of cotton is 9.5%, the air temperature is 120 °C, the speed of cotton is 2.5 m/sec, and the cleaning efficiency of the equipment is 29.3%. , after drying for 30 and 40 seconds, the cleaning efficiency of the equipment is 33.2; 47.4 and 56.1%, it can be seen that the cleaning efficiency of the equipment increased to 23%. The cleaning efficiency of the equipment is 32.1 when the temperature of the air supplied to dry cotton is 140 °C and after the cotton is dried for 10, 20, 30 and 40 seconds; 44.3; 56.2 and 60.3%, and the increase in cleaning efficiency was 28.2%, when the air temperature was increased to 160 and 180 °C and cotton was dried for 10, 20, 30 and 40 seconds. then the cleaning efficiency of the equipment is 35.1; 55.6; 63.2; 68.8% and 38.2; 59.6; 68.3; Making 74.3%, purification led to an increase in efficiency to 33.7÷36.1%.

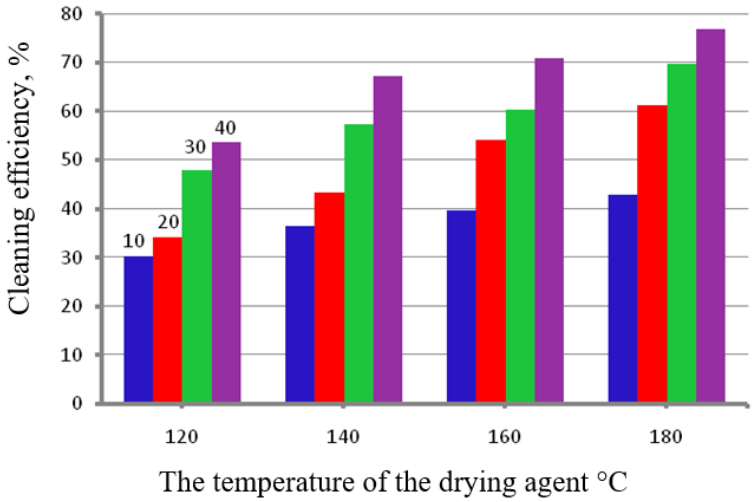


The air speed for drying and cleaning is 2.5 m/s, the humidity of cotton is 9.5%.

Figure 1. Changes in the cleaning efficiency of the equipment over time.

After drying cotton with a moisture content of 11.3% at an air temperature of 120 °C and an air speed of 2.5 m/s for 10 seconds, the cleaning efficiency of the equipment was 27.4%; after drying, the cleaning efficiency of the equipment is 31.0; 44.6; It was 51.3%. When the temperature of the air supplied for drying rises to 140 °C and the cotton is cleaned in the equipment after drying for 10, 20, 30, 40 seconds, the cleaning efficiency of the equipment is 34.8; 50.3; It was 57.1 and 63.8%. When the air temperature rises to 160 and 180 0C and the cotton is cleaned in the equipment after drying for 10, 20, 30, 40 seconds, the cleaning efficiency of the equipment is 33.6; 52.5; 58.0; 65.8% and 36.1%; 58.4; 67.3; 71.4%, it can be seen that the cleaning efficiency increases to 32.2÷35.3%.

After drying cotton with a moisture content of 9.5% at air temperature of 120 and 140°C and speed of 4.0 m/sec for 10, 20, 30, 40 seconds, the cleaning efficiency of the equipment is 31 ,5; 35.3; 49.6; 58.4% and 34.6; 47.1; 58.3; 62.6%, it can be seen that the cleaning efficiency of the equipment has increased to 26.9 ÷ 28.3%. When the air temperature is 160 and 180 °C and the cotton is dried for 10, 20, 30, 40 seconds, the cleaning efficiency of the equipment is 37.6; 48.7; 60.3; 72.2% and 40.7%; 58.3; 67.4; Making 78.2%, purification led to an increase in efficiency to 34.6÷37.5%.



The speed of the air supplied to drying and cleaning is 4.0 m/s, the humidity of cotton is 11.3%

Figure 2. Change in cleaning efficiency of the equipment over time.

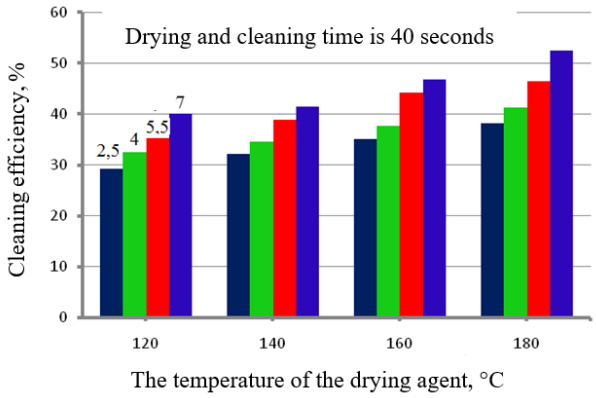
After drying cotton with a moisture content of 11.3% at an air temperature of 120 °C and an air speed of 4.0 m/s for 10, 20, 30, 40 seconds, the cleaning efficiency of the equipment is 30.3; 34.2; 47.8; was 53.6%, the cleaning efficiency of the equipment in the above-mentioned speed and when the air temperature is 140 °C and after the cotton is dried for 10, 20, 30, 40 seconds, the cleaning efficiency of the equipment is 36 ,4; 43.3; It was 57.4 and 67.2% (Figure 2). This indicator, when the air temperature rises to 160 °C and the cotton is cleaned in the equipment after drying for 10, 20, 30, 40 seconds, the cleaning efficiency of the equipment is 39.6; 54.1; It was observed that it was 60.3 and 70.9%, when cotton was cleaned in the equipment after drying at 180 °C for 10, 20, 30, 40 seconds, the cleaning efficiency of the equipment was 42.8; 61.1; 69.6 and 76.8%, it can be seen that the cleaning efficiency increases to 31.3÷34.0%.

After drying cotton with a moisture content of 9.5% at an air temperature of 120 °C and a speed of 5.5 m/sec for 10, 20, 30, 40 seconds, the cleaning efficiency of the equipment is 34.6 ; 39.8; was 53.2 and 62.7%, the cleaning efficiency of the equipment after drying the cotton for 10, 20, 30, 40 seconds in the heat agent with a temperature of 140 °C without changing the air speed is better in turn 39.3; 47.6; 62.5 and 72.6%, it can be seen that the cleaning efficiency of the equipment increased to 28.1 ÷ 33.3%. These indicators are 44.4 when the air temperature is 160 and 180 °C and the cotton is dried for 10, 20, 30, 40

seconds. 58.7; 67.3; 76.2% and 47.7%; 64.3; 73.4; Making 80.2%, purification led to an increase in efficiency to 35.8÷37.5%.

After drying cotton with a moisture content of 9.5% at an air temperature of 120 °C and a speed of 7.0 m/sec for 10, 20, 30, 40 seconds, the cleaning efficiency of the equipment is 36.8 ; 42.4; was 57.6 and 70.5%, when the air temperature is 140 0C and the cotton is cleaned in the equipment after drying for 10, 20, 30, 40 seconds, the cleaning efficiency of the equipment is 41.6; 49.3; 64.8 and 79.7%, it can be seen that the equipment cleaning efficiency increased to 33.7 ÷ 38.1%. These indicators are 44.8 when the air temperature is 160 and 180 °C and the cotton is dried for 10, 20, 30, 40 seconds. 60.9; 70.4; 81.3% and 46.3; 69.6; 76.8; Making 84.9%, the efficiency of equipment cleaning increased to 36.5÷38.6%.

After drying cotton with a moisture content of 11.3% at an air temperature of 120 °C and an air speed of 5.5 m/s for 10, 20, 30, 40 seconds, the cleaning efficiency of the equipment is 32.4; 37.3; 50.9; was 58.2%, at the above-mentioned speed and when the air temperature is 140 °C and the cotton is cleaned in the equipment after drying for 10, 20, 30, 40 seconds, the cleaning efficiency of the equipment in turn is 38 ,2; 45.3; It was 60.2 and 68.4%. This indicator, when the air temperature rises to 160 °C and cotton is cleaned in the equipment after drying for 10, 20, 30, 40 seconds, the cleaning efficiency of the equipment is 42.5; 56.3; 65.2 and 73.8% were observed, when cotton was cleaned in the equipment after drying at 180 °C for 10, 20, 30, 40 seconds, the cleaning efficiency of the equipment was 44.2; 62.0; 71.2 and 79.4%, it can be seen that the cleaning efficiency increases to 31.3÷35.2%.



Moisture content of cotton is 9.5%, dirtiness is 5.4%.

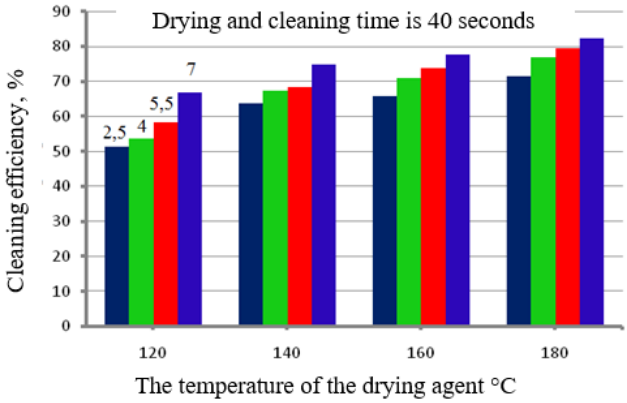
Figure 3. The change in the speed of the air supplied to the drying equipment cleaning efficiency.

After drying cotton with a moisture content of 11.3% at an air temperature of 120°C and an air speed of 7.0 m/s for 10, 20, 30, 40 seconds, the cleaning efficiency of the equipment is 34.6; 40.8; 54.7; was 66.7%, when the air temperature is 140 °C and the cotton is cleaned in the equipment after drying for 10, 20, 30, 40 seconds, the cleaning efficiency of the equipment is 40.1; 47.8; It was 62.6 and 74.8%. This indicator, when the air temperature rises to 160 °C and the cotton is cleaned in the equipment after drying for

10, 20, 30, 40 seconds, the cleaning efficiency of the equipment is 43.6; 58.4; It was observed that it was 67.8 and 77.5%, when cotton was cleaned in the equipment after drying at 180 °C for 10, 20, 30, 40 seconds, the cleaning efficiency of the equipment was 45.4; 67.3; 74.1 and 82.2%, the purification increased the efficiency to 33.9÷36.8%.

During the period of research work, the effect of changing the speed and temperature of the hot air supplied to dry cotton for the same period of time on the cleaning efficiency of the equipment was also studied [11, 12]. The results are presented in Figures 5-8.

From Figure 3, the air temperature for drying cotton with a moisture content of 9.5% and dirtiness of 5.4% is 120 °C, the speed is 2.5 m/sec, and the cleaning efficiency of the equipment is 29.3%. reached, the air speed is 4.0 without changing the air temperature; 5.5; When it is increased to 7.0 m/sec, the cleaning efficiency of the equipment is 32.5; 35.2; It can be seen to increase to 40.1%. When the temperature of the air supplied to dry cotton rises to 140 °C and the air speed is 2.5 m/s, the cleaning efficiency of the equipment is 32.1%, while the speed of the air supplied to drying is 4.0; When it is increased to 5.5 and 7.0 m/s and the cotton is cleaned in the equipment, the cleaning efficiency of the equipment is 34.6; It can be seen to increase to 38.4 and 41.5%. These indicators showed that the cleaning efficiency of the equipment was 35.1 and 38.2% when the air temperature for cotton drying was increased to 160 and 180 °C and the air speed was 2.5 m/sec and the dried cotton was cleaned. The speed of the air supplied to dry cotton without changing the temperature is 4.0; When it is 5.5 and 7.0 m/s, the cleaning efficiency of the equipment is 37.6; 44.2; 46.8 and 41.2; 46.4; It can be seen to increase to 52.5%.



The moisture content of cotton is 11.3%, 6.2% impurity.

Figure 4. The change in the speed of the air supplied to the drying equipment cleaning efficiency.

Analysis of research results. From Figure 4, when cotton with a moisture content of 11.3% and dirtiness of 6.2% was cleaned in the equipment after drying at an air temperature of 120 °C at a speed of 2.5 m/sec, the cleaning efficiency of the equipment was 27.4%. , the speed of the air without changing the temperature is 4.0; 5.5; When increasing to 7.0 m/sec, the cleaning efficiency of the equipment is 30.3; 33.1; It can be

seen to increase to 37.9%. When the temperature of the air supplied to dry cotton rises to 140 °C and the air speed is 2.5 m/s, the cleaning efficiency of the equipment is 34.8%, while the speed of the air supplied to drying is 4.0; When it is increased to 5.5 and 7.0 m/s and the cotton is cleaned in the equipment, the cleaning efficiency of the equipment is 38.2; It can be seen to increase to 41.5 and 43.1%. When the air temperature is 160 °C and the air speed is 2.5 m/sec, the cleaning efficiency of the equipment is 36.6%, while the air speed is 4.0 without changing the air temperature; 5.5; The cleaning efficiency of the equipment is 39.6 when cotton is cleaned after drying at 7.0 m/sec; It was 45.3 and 51.4%. These indicators are when the temperature of the air supplied to dry cotton rises to 180 °C and the air speed is 2.5 m/sec, and the cleaning efficiency of the equipment when cleaning dried cotton is 40.2%, the temperature of the air is o 'unchanged speed 4.0; When the speeds are 5.5 and 7.0 m/s and the dried cotton is cleaned in the equipment, the cleaning efficiency of the equipment is 42.8; It can be seen to increase to 53.6 and 61.7%.

Conclusion. As a result of experimental and research work, it was found that increasing the temperature of hot air for drying cotton from 120 °C to 180 °C and increasing the air speed from 2.5 m/s to 7.0 m/s accelerates the process of evaporation of moisture from cotton. . It was found that the speed of the hot air supplied to drying significantly affects the change in the cleaning efficiency of the equipment for cleaning cotton from small impurities. Basically, cotton with a moisture content of 9.5% and dirtiness of 5.4% at an air temperature of 120, 140, 160, 180 °C, 2.5; 4.0; 5.5; The cleaning efficiency of the equipment after drying at the air speed of 7.0 m/sec was from 29.3% to 52.5%. Cotton with moisture content of 11.3%, dirt content of 6.2% at air temperature of 120, 140, 160, 180 °C, 2.5; 4.0; 5.5; After drying at an air speed of 7.0 m/sec, the cleaning efficiency of the equipment increased from 27.4% to 61.7%.

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