

# THE NEW TECHNOLOGY FOR HUMIDIFICATION OF SEED COTTON BEFORE GINNING AND COTTON FIBER BEFORE PRESSING

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## ABSTRACT

While Uzbek cotton has excellent natural properties, the fiber sometimes suffers quality deterioration due to excess humidity. Humidity conditioning of raw cotton and cotton fiber is critical because humidity is one of the most important factors influencing the results of primary processing of cotton, for both the storage of harvested raw cotton and pressing the ginned fiber into bales.

## INTRODUCTION

In domestic practice, when raw cotton is procured, it usually has a high moisture content and requires sufficient drying to ensure it's clean. However, extensive drying and cleaning have both positive and negative effects on the fiber's natural properties, so care must be taken to ensure the fiber's natural properties are not degraded. One of the biggest challenges is that all parts of seed cotton don't dry at the same time. Cotton fiber, for example, dries much more quickly than the seeds do. Due to the fact that the evaporation surface of fiber is about 250 times greater than of the seed, "over-dried" fiber becomes brittle and loses some of its elasticity. Mechanical impacts that occur during the processing of raw cotton result in both internal and external stress that can rupture and degrade the fiber [1].

During the process of drying and cleaning seed cotton, these changes usually aren't very noticeable - but they reveal themselves during the ginning process: excess fiber left on the seeds, broken seed fragments that contaminate the bale, a reduction of staple length and an increase in short fiber content.

After ginning, the next important part of processing is the moistening of fiber before pressing. In accordance with Uzbekistan's standard, cotton fiber should be moisturized to the level of 7.5 - 8.5% before it's pressed into a bale to maintain the optimal structural and mechanical properties of cotton fiber.

After moistening: the fiber becomes less elastic and more susceptible to the mechanical pressing action, the tensile strain on the strapping belt is lessened, fiber appearance improves, static electricity accumulated on the fiber is neutralized, volume density and the weight of bales increases, and overall dimensions of the bale are reduced. In the end, it results in lower energy expended by pressing equipment, a reduction in the usage of packaging materials, the prevention of strapping breakage and bale repressing, and reductions in transport costs.

## RESULTS OF EXPERIMENTS

With the proper technologies and techniques, however, those detrimental effects can be reduced or eliminated during the humidification of raw seed cotton before it's ginned. Prior research suggests that the optimal moisture of raw seed cotton for the most efficient ginning process is about 8% [2]. A higher moisture content causes a decrease in the gross productivity of gins, reduces fiber output, and increases the scope of fiber defects and trash content. Ginning excessively dry raw cotton, on the other hand, leads to a shortening of fiber length due to mechanical damage, and the formation of such defects as seed coat fragments and seed coat with fiber.

In order to get raw seed cotton's preginning humidity up to the required level of 7.5-8.5% and thus preserve the natural properties of cotton fiber and cotton seeds, researchers developed a new humidifier - one based on a wetting chamber mounted on the unloading tray of cleaning unit "UHK" (1HK), which was made in the form of hopper (see Fig. 1). This unit has received a patent in the Republic of Uzbekistan: FAP 00957. Under working conditions at Chinaz cotton ginny experiments were conducted using the new plant humidifier. The experiment showed the possibility of providing moisture growth in the range of 0.4-0.7%.

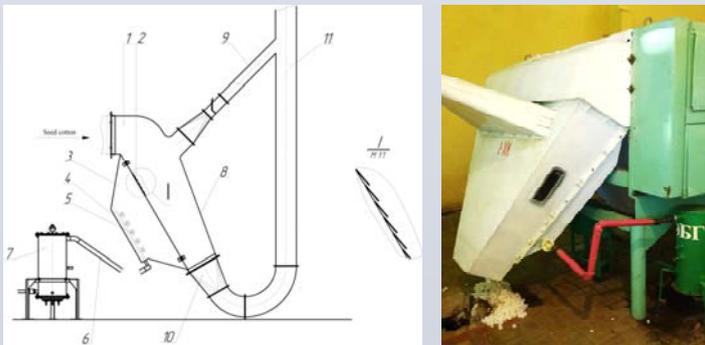


Fig.1. Humidifier of seed cotton on the unit "UHK" (1HK)

Test results shown in Table 1 indicate that such quality characteristics as micronaire, maturity, reflectance and yellowness degree not tend to change depending on the moisture content of ginned cotton and remain practically constant. However, such indices as UHML, Uniformity index changed significantly.

So the UHML obtained by cotton ginning with 7.64% moisture content was 0.005 inches longer than fibers obtained by cotton ginning with a moisture content of 7.13%. The uniformity index of fibers has tendency to improve at humidified cotton due to preservation of the natural length of the fiber.

Table 1

Quality characteristics of cotton fiber	Moisture of raw seed cotton before ginning	
	7,13 % (without humidification)	7,64 % (with humidification)
Micronaire	4,69	4,69
Maturity	0,86	0,86
Strength, gf/tex	31,61	31,57
Upper Half Mean Length (UHML), inch	1,109	1,114
Staple code	36	36
Uniformity Index (UI), %	82,48	82,63
Short Fiber Index (SFI), %	9,00	8,99
Trash Area, %	0,24	0,30
Reflectance degree (Rd), %	78,89	78,34
Yellowness (+b), %	9,01	8,94

The appearance and layout of the cotton fiber humidification unit "UVR" is shown in Figure 2 (the humidifier is installed after the cotton condenser, before the inclined tray of press). It has received a patent from the Republic of Uzbekistan: FAP 00390.

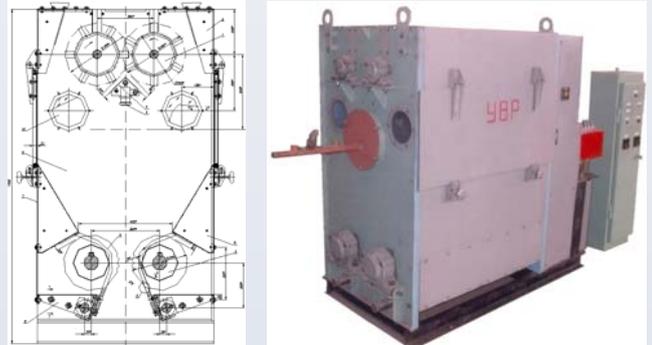


Fig.2 Sketch design and appearance of the cotton fiber humidifier

Three methods of adding humidity to the loosened pieces of fiber were developed:

The first option provides preparation and supply of water with temperature of not less than 75°C and spraying it by a nozzle, which is positioned centrally between loosening drums straight under the grooved drums.

The second option provides preparation and feeding of humidity agent with temperature not below 75°C in the form of mixture of air and water (mist) through the processing window in the side wall of the humidifier.

The third option provides preparation and feeding of a mixture of steam and water slurry, generated by a steam generator.

Installation of the cotton fiber humidifier "UVR" was carried out at the Buka ginny in Tashkent region and demonstrated high uniformity of cotton fiber humidification. The gain of fiber humidity in the device was 1.45% and demonstrated that humidification technology does not deteriorate fiber quality parameters, as long as fiber humidity doesn't exceed 8.5%.

## CONCLUSIONS

The specialists of the Scientific Center «Paxtasanoat Ilmiy Markazi», Tashkent institute of textile and light industry, JSC "Uzpakhtaexport" work together on creating a new technology for humidification of seed cotton and cotton fiber.

Results of studies in the area of humidification of seed cotton and cotton fiber have allowed to create the new device for humidification of seed cotton before ginning and new apparatus for humidification of cotton fiber before pressing. Both devices received a patents of the Republic of Uzbekistan for useful models.

Humidification of seed cotton before ginning provided the net gain of moisture up to 0.6%. Moistening of seed cotton in the range of 8% prevents shortening of the fiber length, increasing the uniformity. Applied humidification technology of cotton fiber before pressing provides moisture gain up to 1,45% and does not deteriorate the fiber quality parameters.

## REFERENCES

1. Journal "The Cotton Yearbook", December 2015 issue, <https://www.cottonyearbook.com>
2. Report of an Expert panel of Ginning Methods, International Cotton Advisory Committee, NY, September 2001. <https://www.ICAC.org>.

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