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ANALYSIS OF THE USE OF HOT AIR COMING OUT OF THE DRYING DRUM

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Abstract

This project makes a few suggestions to avoid wasting dusty hot air coming out of the drying drum installed in ginneries. The aim is to reduce the ecological and environmental damage of ginners and to divert the dusty hot air from the drying drum to useful work.

Keywords: drying drum, hot air, filtration, greenhouse, laboratory rooms.

Introduction

At present, ginneries of the Republic of Uzbekistan use several technologies for drying seed cotton. They use tower dryers, floor dryers and drying drums. The most common of these are drying drums. The cleaning departments of the enterprises are currently equipped with 2SB-10, SBO and SBT drying drums for drying or heating the seed cotton. To ensure the continuous operation of these drying drums, they are equipped with heat supply, transport equipment and supply systems [1-7].

Cotton raw contains an absolutely dry mass and a certain amount of moisture. The moisture content of raw cotton is the ratio of the mass of moisture contained in it to the mass of absolutely dry raw cotton, expressed as a percentage [8-16]. To ensure high fibre quality and efficient operation of process equipment, raw cotton must be dried to a technological humidity of 7-8%.

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The Main Part

Characterized by moisture extraction, moisture and moisture production of raw cotton, uniformity of drying, and heat consumption per kilogram of evaporated moisture. Moisture selection shows the amount of moisture that evaporated in the dryer, relative to the mass of absolutely dry raw cotton in per cent.

As a coolant for drying raw cotton, a mixture of combustion products of tractor kerosene or natural gas with atmospheric air is used. The temperature of the heat carrier is determined depending on the moisture content of the raw cotton and the design of the dryers [14-19].

When drying, it is not allowed to overheat raw cotton and its components (maximum temperature of seeds should not be above 70 ℃, fibres - no higher than 100 ℃), therefore the drying time and temperature of the coolant are appropriately selected.

Drums of cotton dryers inside are filled with lifting and logging devices for mixing raw cotton and improving the drying process. The axial movement of cotton in drum dryers is carried out due to the inclination of the drum or the pressure of the coolant on the particles of raw cotton.

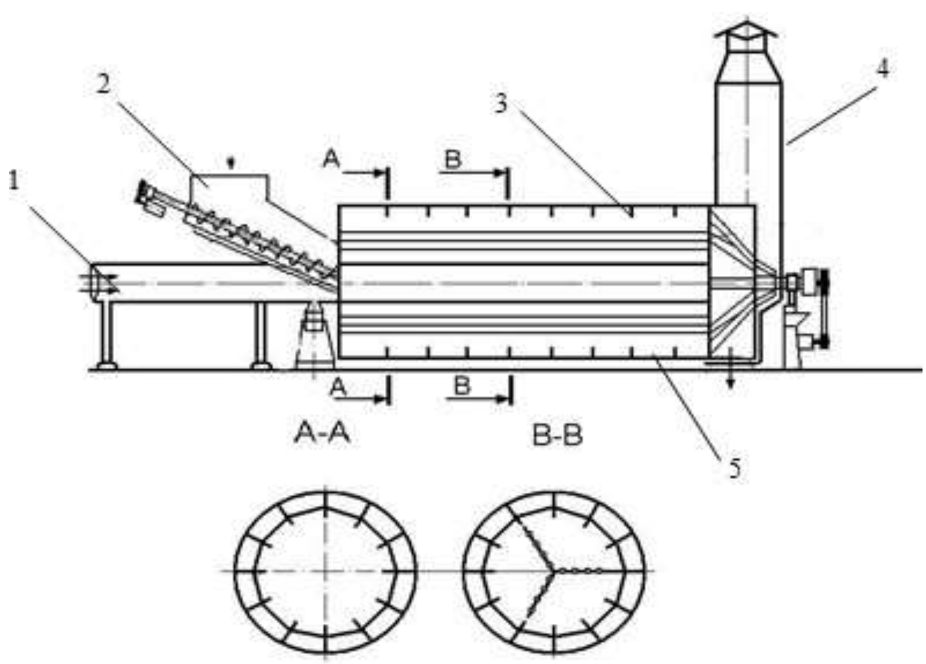

Fig. 1. Scheme of drum dryer 2SB-10

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In the cotton ginning industry, drum dryers 2SB-10 (Fig. 1) are widely used. The raw cotton enters the feeder through the shaft, from where it is sent to the drying drum by an inclined auger. Then, rising with longitudinal blades and falling into the lower part of the drum, the raw cotton is dried. When falling under the influence of the coolant, cotton moves along the drum axis to the output tray of the dryer. The spent coolant from the dryer through the exhaust pipe goes into the atmosphere [20-26]. The drum is mounted on the front support and the rear support. Rotation of the drum is carried out by a drive consisting of a reducer and an electric motor. 1-pipeline of drying agent; 2 feeders; 3-drum; 4-pipe exhaust air; 5-blades.

Table 1. Technical characteristics of the drum dryer 2SB-10

1	Productivity for dried raw cotton,	t / h up to	10000
2	Productivity on evaporated moisture,	t / h up to	0.8
3	Heat consumption per 1 kg of evaporated moisture	kcal	2200-2500
4	Coolant temperature at the inlet from the dryer,	°C	0 to 280
5	Drum rotation frequency	min	10
6	Power of electric motors on the drum drive	kW	13
7	auger screw		4
8	Dimensions		
9	(length, width, height without a pipe),	mm	14730x4865x3800
10	Weight,	kg	10 300

Heat supply of cotton dryers. Cotton dryers are supplied with a heating agent with the help of special device heat generators. They mix liquid or natural gas with atmospheric air at the high temperature obtained by burning fuel (up to the required temperature and weight consumption) and reduce the temperature and transfer the gas-air mixture - "drying agent" to the drying chamber.

Each cotton drying drum is connected to a heat supply device as usual [23-28]. The device must prepare a drying agent that corresponds to the heat production capacity, ensures complete combustion of the fuel and meets the requirements of the initial processing of cotton, sanitary and technological.

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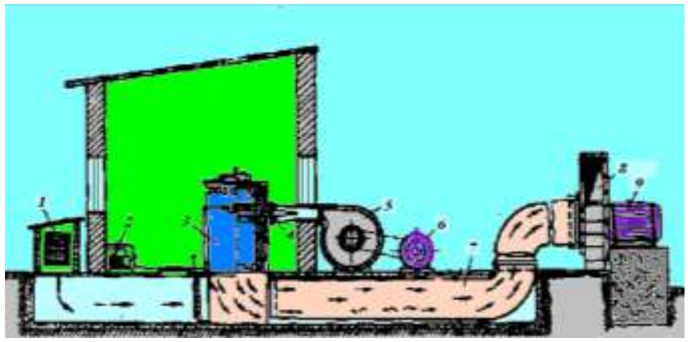

Figure 2. The Drying drums hot air supply scheme
1) fire department; 2) TG-1.5 heat generator; 3) smoke extractors; 4) barriers; 5) Pipe 6) suppliers; 7) drying drum

It has an ease of operation and replacement of defective parts, long-term maintenance-free operation, as well as the ability to automate operation. The gas burner is equipped with two multi-nozzle (slotted) tunnel burners. The mixing chamber consists of two shells, one in the form of a cone and the other in the form of a detachable truncated cone. To transfer the heating agent to the drying equipment, the heat generator is connected to the intake pipe of the smoke extractor type DN-11.2. The project we are proposing involves diverting the air from the drying drum to various processes.

– Filtration of dusty air and directing the filtered hot air to the purification process;
– Establishment of greenhouses at ginneries and directing the air from the drying drum to the greenhouses;
– Directing hot air from the drying drum to provide heat to the laboratory rooms.

Conclusion

We will get acquainted with these processes below:

1) Battery sleeve filter. The filter element of this type of device is made of woven material (Fig. 3). Dusty gas moving from the bottom up enters through an open hole at the end of the filter sleeves. Then, as the cylinder passes through the side surface of the sleeves, the gas is cleared and released, and the solid particles are trapped in the inner wall of the sleeves.

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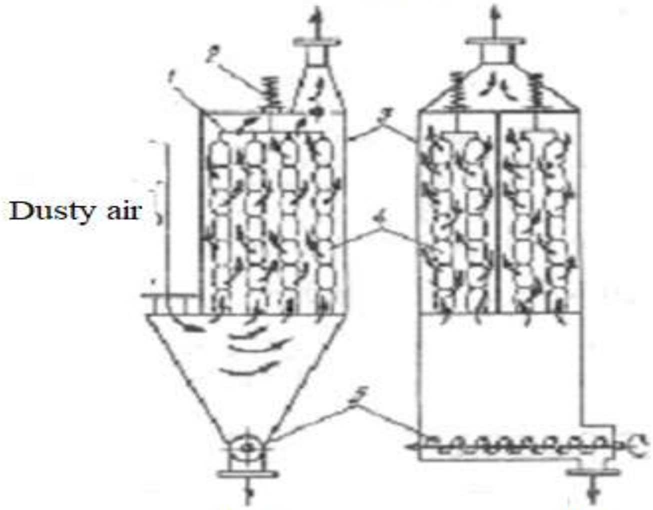

Figure 3. Sleeve filter.

1) Rom; 2) shaking mechanism; 3) shell; 4) sleeve; 5) auger.

During use, the dust layer increases and the resistance of the filter increases. To reset the filter sleeves, it is necessary to periodically shake them using mechanism 2. Then, the lost dust is spilt on the surface of the feed and is removed using auger 5. In some cases, the filter elements are blown in the opposite direction using compressed air or gas to regenerate the feathers. In some cases, sectional filters are also used. In this case, each section of the track has a shaking mechanism. This allows you to clean the filter sections sequentially, which means that you can reset the filter elements without stopping the filter device.

The filtration rate of continuously operating width filters is 0.007 ... 0.017$m^3/(m^2.s)$. However, due to the continuous regeneration of the filter tissue filtration rate increases to 0.05 ... 0.08 $m^3/(m^2.s)$. The hydraulic resistance of the most common lightweight filters is 1.5 ... 2.5 kN / m^2 (150 ... 250 mm. above water).

If the sleeve filters are used correctly, the degree of purification of gases from fine, dispersed dusts is 98 .... 99%. The sleeves are made of natural, synthetic and mineral materials.

In this way, we can direct the filtered air to the dehumidification or purification departments. However, given the frequent replacement of filters in this process, the cost is likely to exceed the norm.

2) This method is intended to direct hot air to laboratory rooms and similar living rooms located in ginneries. However, this method can be used only in cold weather. On hot days, this method is ineffective.

3) The proposed method involves the establishment of greenhouses in the fields of ginneries, where the hot air from the drying drum is directed directly to the greenhouses. This method will save the ginners extra income from the greenhouses and waste heat.

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