

A New One of Heating and Humidifying Equipments for Tobacco

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Abstract. SIROX is a new heating and humidifying technology to substitute HT. It changes the heating insufficient and humidifying poor uniformity of tunnel HT. It uses locking air means in feeding and the steam is supplied through the rotary joint to the turning bars with steam orifice. So that the material will uniformly warm and humidify better and overcome the shortcomings of HT's. SIROX has simple structure, low maintenance costs, easy to clean. This paper analyzes the composition and working principle of several heating and humidifying devices and their respective advantages and disadvantages, provides a reference for the heating and humidifying technology.

Introduction

In the tobacco processing the task of heating and humidifying process will make the leaf or stem cut tobacco be heated and humidified, and then the cut tobacco with moisture content will continuously enter the air drying tube and the drying drum to be dried quickly, so that it can improve filling capacity. As one of the main aspects in the tobacco processing, the heating and humidifying device has a very important role [1]. The mature in the world mainly are the HT tunnel, the drum and the vacuum equipment, but because of the limitations of its own structural characteristics that limit some equipment continuously develop in the tobacco industry.

Germany HAUNI Company's SIROX heating and humidifying device, due to its good performance and simple operation, gradually is accepted and applied by tobacco companies in the world and has been gradually used in some medium and large tobacco factories in China.

Several Traditional Heating and Humidifying Equipments

HT tunnel heating and humidifying device

Tunnel heating and humidifying equipment is mainly used in cut tobacco production line of cigarette factories. The leaf, stem, or cut tobacco will be heated and humidified or expansion, to improve filling capacity of cut tobacco or increase the moisture content and temperature of the leaf.

In the tunnel heating and humidifying device uses the vibration to transport material, the material inside the tunnel is moved forward in parabolic state. Heating and humidifying process completed in the material state of movement and looser, and steam injects evenly throughout the whole of the tunnel, the material can be sufficiently contacted with steam humidifier and be heated and humidified quickly. So it has good effects compared to other devices.

Roller Blades Heating And Humidifying Device

Roller blades heating and humidifying equipment is mainly used on tobacco production line, to heat, humidify and loose the tobacco leaves, and for other processes of treatment.

After the tobacco leaves go into the drum, which is rotated and has an axial inclination, so that the leaves can flow to the discharge port direction easily and automatically. When the leaves go into the inlet of drum more than near 1.5 m, the humidifier water pipeline will open. From this point the steam

pipes and water pipes are in working condition, humidifier water and steam is fed to the nozzles to inject out to the leaves. Under the action of the steam pressure, the steam and water are mixed to mist spray and humidify the leaves. The leaves are rolling forward and contacting with steam, the water is fully constantly absorbed. The leaves are gradually loosened too and become soft ones, so as to achieve the technological requirements. The amount of water is decided by the control system in the production line. The electronic scale measures the weight of incoming materials, the system compares the set water and the amount of water detected by electromagnetic flow meter and decides how much water will be added by opening the pneumatic control valve to regulate. The humidifier water flow can change with the signals of electronic scale measured, to achieve the quantitative increase in the proportion of water by automatic control. [2]

Vacuum Heating and Humidifying Device

To facilitate a vacuum cabinet and spatial distribution of materials to be analyzed, to define several spaces: ① First Space (space in a vacuum cabinet full of tobacco); ② Second Space (gap between tobacco); ③ Third Space (cell gap between the tobacco tissues). In the vacuum process, the first extraction air belongs to the First Space's, and then the Second Space's, the final one will be the Third Space's. Of course, in the actual extraction process, these three sub-processes are crossed and continuously complete. If the vacuum process was not required, the air density of the First and Second space is relatively large, the extraction air from Third Space is relatively small, the air-filled pores within the tobacco, or even with water vapor to the surface of the tobacco, it is hard to be absorbed by tobacco and let alone penetrate into the interior of tobacco tissue. Thus, the higher the vacuum, the smaller air density in the First and the Second Spaces, the easier extraction air from Third Space. The more air extracts from Third space, the stronger ability to absorb moisture in the tobacco is, and the stronger humidification is. Theoretically speaking, the higher the vacuum is, the better the humidification penetration rate is, pressure, the larger pressure gradient is in the vacuum cabinet, the more rapidly the humidified steam flows from the high pressure area to the low pressure area, and the faster the humidification is. [2]

Features of Traditional Heating and Humidifying Devices

Under ideal conditions tobacco's humidifying speed and absorbent humidifier speed (the speed of the intake humidification air) require and match together. [3]

Be analyzed from the perspective of the temperature, the temperature has a significant impact on the absorbent capacity of the tobacco. On the one hand, because tobacco is a sponge-like porous material, the high temperature water is, the more easily it penetrates to the inside of the tobacco tissue. On another hand, the moisture content is large at high temperature and increases the temperature gradient for transferring water into the inside of tobacco. In the tobacco humidification process, due to water comes from high temperature steam, as water increases, must be accompanied with increasing temperature. The more moisture increases, the higher temperature increases also. Thus, temperature and moisture are two control elements during tobacco processing and are interrelated two quantities that can not be viewed in isolation state. On the material processing time, the vacuum machine has the longest time up to a dozen or even twenty minutes (of course, more time is for the vacuum pump and not humidification). For the drum machine, a few minutes for the material through it, while the drum rotation speed of the current heating and humidifying drum machine adopts frequency control and it will change the processing time. If the material passes through the drum is too short, no time to absorb heat to increase temperature, no temperature based on the amount of moisture absorption, the tobacco will not be humidified.

Compositions and Process Control of SIROX Equipment

Compositions and the Main Functions of SIROX

In Fig. 1, SIROX heating and humidifying equipment mainly is consisting of feed air lock, expansion unit, compressed air system, steam system, cleaning water system, moisture discharge system, vibrating conveyor. Some devices are described below:

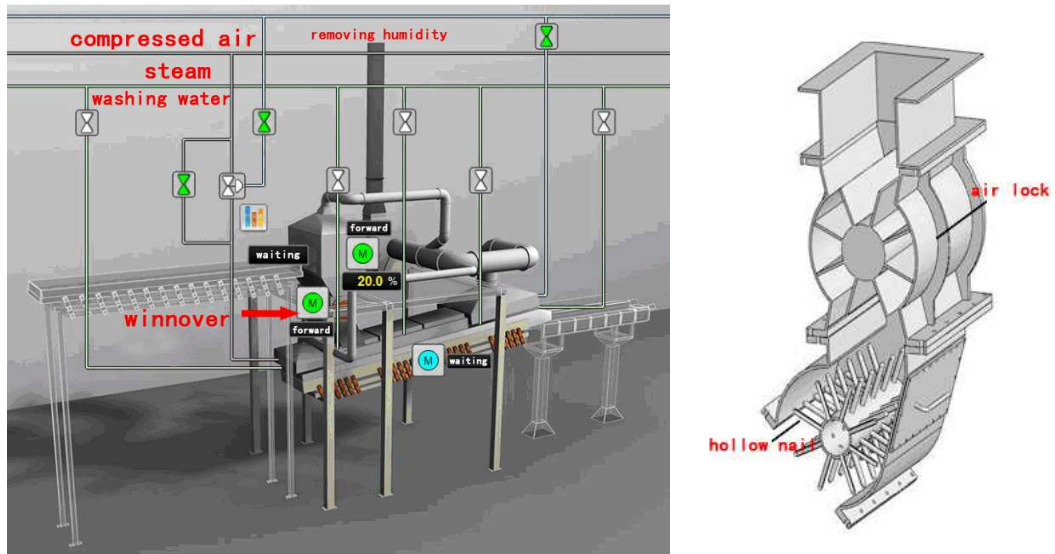


Fig. 1 SIROX appearance and internal perspective

The feed air lock device: When compressed air supply source fails to stop, using the feed air lock to control the channel and turn off valve, the valve maintains the expiring position to ensure the normal process until the system eliminates accidents and works again, the lock will open channel and restore normal work state.

Expansion Unit: The main advantage is rapid expansion of tobacco at a high temperature of 180-350°C, the vapor pressure quickly built up is much greater than cell osmotic pressure inside the leaf, water is almost in the form of evaporation from the leaf cells explosion came out within 1-2 seconds and the tobacco is faster dehydrated and expanded in stereotypes.

Compressed air system: from supply side to end side as follows: air compressor → tank → filter → dryer → air pipeline → end port, compressed air is generated by an air compressor and a steady compressed air is provided to SIROX heating and humidifying device.

Cleaning water system: the main cleaning function provides to SIROX heating and humidifying equipment. After the device is completed, it would have a lot of dirt and dust inside, cleaning water system can easily clean them.

Vibrating conveyor: vibrating exciter makes the trough vibrate and make the material sliding and throwing along a certain direction. The vibrating conveyor mainly completes tobacco feeding out.

Process Control

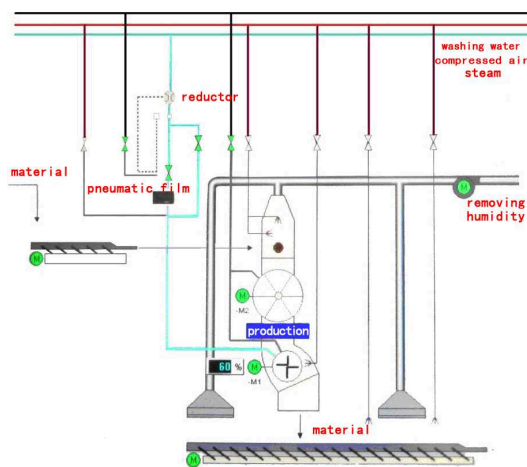


Fig. 2 Process layout of SIROX

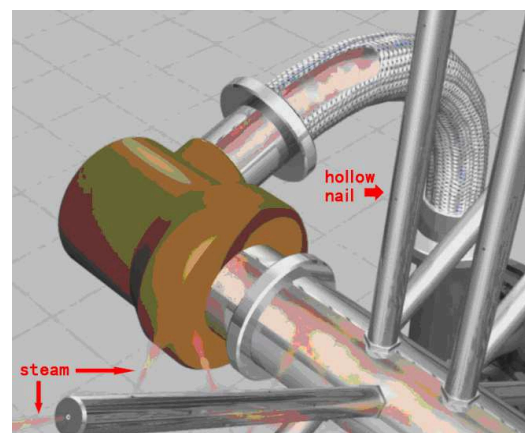


Fig. 3 Steam injection work of SIROX

Shown in Fig. 2, 1 vapor air with 2~8 bar pressure saturated steam through valves, pneumatic film valve goes into expansion unit Winnover of SIROX and goes out from the nails with the hollow diameter of 1.3 mm on the shaft (Fig. 3) and ejects on the tobacco.

1 compressed air participate the stroke control in the steam piping pneumatic film valve.

5 cleaning water go into the SIROX, the right 2 of clean water go into vibrating conveyor, the middle 2 go into the hood and the expansion unit respectively, the left 1 of cleaning water goes through steam pipe and into hollow nails to complete cleaning SIROX automatically.

Contrast SIROX and Traditional Ones

From its principle we can see that SIROX has a huge advantage.

(1) As the SIROX heating and humidifying equipment is used in expansion or humidification of tobacco, it can increase the filling capacity and the workability. SIROX changed the work method of traditional HT tunnel heating and humidifying device by making steam go through the rotary motion of the hollow nails to applied onto the tobacco and the nails can loose tobacco too. According to the mix of materials, the outlet temperature of the material is available in 70~95°C that will have a better filling capacity.

(2) Simple structure, low maintenance cost, self-cleaning.

(3) Heating and humidifying strength;

(4) Heating and humidifying smoothly;

(5) Small occupation area;

(6) Large capacity, high thermal efficiency;

(7) High automation and intelligence.

Although SIROX heating and humidifying device has many advantages, but because of the need of import, one-time investment is higher, domestic maintenance technology is limited, and easily leads to a longer cut tobacco wrapped on the nails, it is needed to improve continuously. [4][5]

Conclusions

This paper completed the comparison of SIROX with other traditional devices and found that SIROX heating and humidifying device has many advantages. We should overcome its shortcomings and use it in a proper condition, the quality and filling capacity of tobacco will increase. In order to improve the quality of tobacco and apply SIROX well, it provides a very good reference.

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