SJIF Impact Factor 2022: 8.197| ISI I.F. Value:1.241| Journal DOI: 10.36713/epra2016 ISSN: 2455-7838(Online)
EPRA International Journal of Research and Development (IJRD)
Volume: 7 | Issue: 5 | May 2022 - Peer Reviewed Journal

THE ROLE OF AIR CONDITIONING IN TEXTILE FACTORIES IN THE REPUBLIC OF UZBEKISTAN

Yusupov Azamat Alijonovich[1], Mamadaliyeva Naima Ilxombek qizi[2]
[1]PhD, Assistant Professor in Department of «Automation of Machine-Building Production» Andijan Machie-Building Institute.

[2]master Student of the Department « Automation of Machine-Building Production», Andijan Machie-Building Institute.

ABSTRACT
This article is devoted to the analysis of the necessity of using automated air conditioning systems in textile factories. The article discusses the impact of microclimate conditions at textile factories on product quality and labor productivity. Information is presented on the stabilization of microclimate conditions at textile enterprises and the increase in labor productivity. A graph has been built to determine the boundary conditions of work showing the enthalpy and humidity of the processed air.
KEYWORDS: *temperature, humidity, flow rates, condensate, air flow, evaporation, enthalpy.*

INTRODUCTION

Uzbekistan occupies a leading position in the world in the cultivation of cotton and its export. In recent years, the export of cotton fibers has sharply decreased in Uzbekistan, much attention is being paid to the production of cotton yarn, fabrics and finished knitwear. In the production of high-quality threads and finished products from cotton fibers, along with the implementation of large-scale measures to create scientifically based and new technologies and improve production efficiency, a favorable investment climate is being created for foreign investors.

The main function of air conditioners in textile factories is to maintain the temperature, humidity, flow rate and cleanliness requirements of the room: on the one hand, to meet the temperature and humidity requirements required in the textile production process, on the other hand, it must also ensure safety and producers' health [1-4]. The indoor temperature and humidity of textile factories are generally high, and the energy consumption of air conditioning is also the main energy-intensive part of textile factories [5-7].

Statistics show that the electricity consumption of its equipment is about 30% of the total electricity consumption of the enterprise. Therefore, reducing the energy consumption of air conditioners has become an important aspect of reducing the cost of enterprises.

In the production process of textile factories, the emissions of fibrous fluff, fly dust, waste heat and residual moisture are large, and all kinds of dust are more harmful to the health of operators; at the same time, it is necessary to prevent the formation of "charcoal ash yarn" in the textile process, resulting in a large amount of treated air in the textile air conditioning system.

From the point of view of air conditioning, it is not energy saving, because the air supply volume must also meet the requirements of ventilation and dust removal, so reducing the power consumption of air supply purification can effectively achieve energy saving.

Climatic conditions at the enterprise are one of the main factors that directly affect the quality of products in the process of yarn production. An increase in air temperature and relative humidity at the enterprise or its decrease in the established norms leads to a break in the threads, which in turn has a great impact on both product quality and labor productivity [8, 9].

Cotton fiber is a fiber with a high moisture absorbing capacity, so it is difficult to tell if it is wet by holding it with your hand even at 20-25% humidity. Normative moisture content of the fiber is up to 8-12%. This property is associated with the geometric and molecular structure of the fiber. Although cellulose is a fibrous base, it is denser in cotton fiber than in oily pulp. Cotton cellulose in the same conditions absorbs 6-7%, wood pulp 8.1%, viscose artificial fiber 12.2% of moisture.

With increasing humidity, the fiber increases their adhesion between themselves and the working parts. At low humidity, their electrification increases due to a decrease in the conductivity of the electric charges of the fibers, so fibers with low humidity are additionally moistened during processing. The main indicator of yarn quality is the air conditioning system in the process of spinning cotton yarn.

SJIF Impact Factor 2022: 8.197| ISI I.F. Value:1.241| Journal DOI: 10.36713/epra2016 ISSN: 2455-7838(Online)
EPRA International Journal of Research and Development (IJRD)
Volume: 7 | Issue: 5 | May 2022 - Peer Reviewed Journal

Generally, traditional air conditioners use fixed load as the rated output concept to maintain air quality, temperature, humidity and dust. It is an expensive guarantee of quality.

Today's rapid development of industrial equipment creates a variety of ways to use it. That is, the output power through intelligent energy saving can maintain the air quality as much as possible and save costs at the same time.

IMPROVE THE PARAMETERS OF AIR CONDITIONING EQUIPMENT

Changes in the content of water vapor in the air will have a significant impact on the dryness and humidity of the air, which will greatly affect the comfort and health of people, the yield and quality of products, the production process, the condition of equipment and energy costs for air treatment.

At present, the air treatment process in textile factories commonly uses water spray chambers in combination with mechanical cooling. As long as the heat exchange of the mechanical equipment is not reduced (the volume of processed air is constant), improving the COP coefficient of the refrigerator can effectively achieve energy savings. The main way to increase the COP value is to lower the condensing temperature or increase the evaporating temperature. Since the evaporating temperature of the chiller is limited by the operating parameters of the air conditioning system, the improvement range is limited, so without increasing the power consumption, a decrease in the condensing temperature means an increase in temperature. The main way to measure the COP value of a system is to use reclaimed condensed water or other refrigerant to directly cool the condenser to realize condenser cooling.

Enthalpy is the total amount of heat contained in the air [10]. This can simply be understood as the generalized internal energy, i.e. how much energy the air contains.

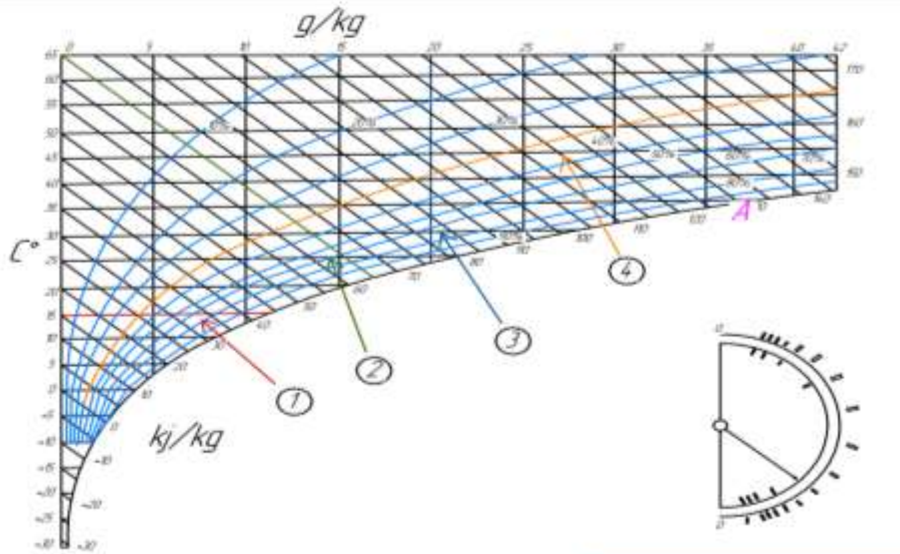

Fig . 1. Construction of the enthalpy hygrogram of air: ***1- isotherm; 2-isoenthalpy; 3-line of isohumidity; 4 - line of equivalent relative humidity.***

In air conditioning engineering, the most common air treatment process is cooling or heating air, with questions often raised such as the amount of cooling required to cool the air from 30°C to 20°C, or the amount of heat required to heat cold air at 5°C to 20°C such problems. As shown in Figure 1, enthalpy is a parameter representing the energy state of air and can measure the change in air energy.

Another method for constructing a line of heat and moisture ratio is the method of auxiliary points (A, B) in fig. 2.

The dew point temperature is the temperature at which water vapor in the air turns into dew drops. The temperature at point A in Figure 1 is 35°C, the relative humidity is 100%, the enthalpy value is 130 kJ/kg, and the moisture content is
36.6 g/kg.

SJIF Impact Factor 2022: 8.197| ISI I.F. Value:1.241| Journal DOI: 10.36713/epra2016 ISSN: 2455-7838(Online)
EPRA International Journal of Research and Development (IJRD)
Volume: 7 | Issue: 5 | May 2022 - Peer Reviewed Journal

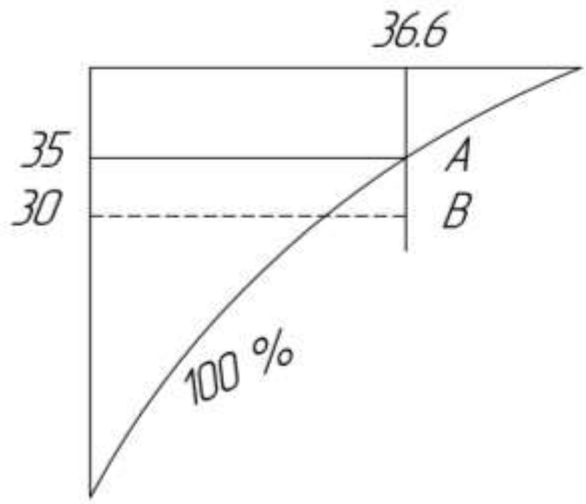

Fig. 2. Building a line of heat and moisture ratio with the method of auxiliary points.

At this time, if the temperature drops to 30°C, the moisture content and air pressure remain unchanged. Point A reaches point B (virtual point). At this time, the relative humidity exceeds 100%, and excess water will condense into water droplets from a gaseous state until the relative humidity becomes less than or equal to 100%.

Figure 3 shows an example of the use of air conditioners in winter and summer and the corresponding changes in the psychrometric map in textile factories.

Where point A: A room without air conditioning in a typical summer, temperature: 30°C, relative humidity: 60%, moisture content: 13.6 g/kg. (A → C) - domestic air conditioner cooling line in summer. Humidity decreases: water vapor is “spit out” by people and objects in the room < drainage of the outdoor unit of the air conditioner.

- *enthalpy reduction*: heat generated by people and things in the room < cooling capacity of the air conditioner. If the room is too large or the window is open, the top may be too large and the room will not be cold.

- *lower temperature:* lower enthalpy means less air energy and lower temperature.

- *relative humidity rises:* the colder the air, the less the desire to "drink" water. At point A, the air can "drink" 3 g of water, the air contains 1.5 g of water, and the relative humidity is 50%. At point B, after cooling, only 1g can be "drinked", and 0.8g goes into the drain pipe, 0.7g remains, and the relative humidity is 70%. Since the air has a low desire to "drink" water, it is usually not too dry to turn on the air conditioner in summer.

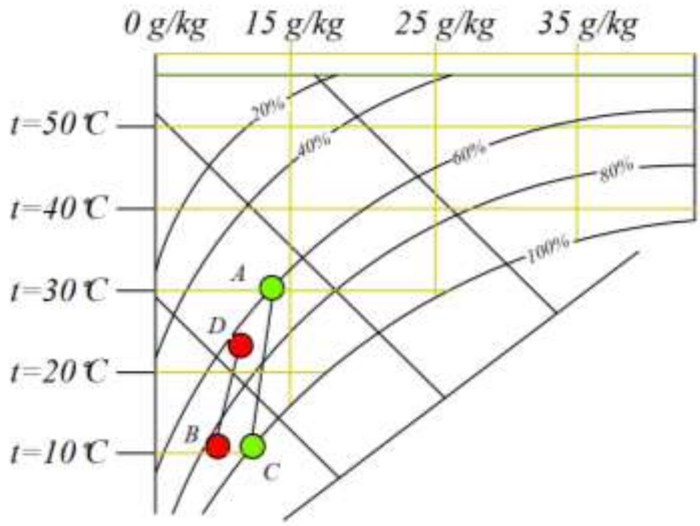

Fig. 3. With the use of air conditioners in winter and summer and the corresponding changes in the psychrometric map in textile factories.

SJIF Impact Factor 2022: 8.197| ISI I.F. Value:1.241| Journal DOI: 10.36713/epra2016 ISSN: 2455-7838(Online)
EPRA International Journal of Research and Development (IJRD)
Volume: 7 | Issue: 5 | May 2022 - Peer Reviewed Journal

Where point (B → D) is the domestic air conditioner heating line in winter.

- *Enthalpy increase:* heat lost by the room < heat added by the air conditioner. If the room is too large or the window is open, the top may be too large and the room will not heat up.

- *Temperature increase:* the air heats up, the energy increases and the enthalpy value increases.

- *Increased moisture content:* as the temperature rises, the air has an increased desire to "drink" water, constantly absorbing moisture from the air.

Relative humidity decreases: constantly "feeding" water from the air, still cannot satisfy the desire to "drink" water, which increases greatly with increasing temperature, and the air is still "thirsty".

The digital example can be viewed as a process from B to A. Since the air is constantly drinking water, the air conditioner can be very dry in winter. You can put a basin of water in the room and let the air "drink" the water that has evaporated in the basin, and not the water of our skin.

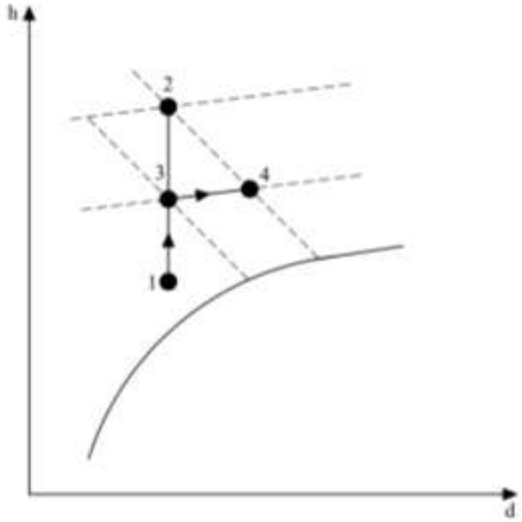

Fig. 4. Enthalpy and humidity of the treated air in the premises.

When there is no water condensate to cool the condenser, all the heat dissipated by the condenser is used to heat the air, and this straight line on the enthalpy is directed upwards. and humidity diagram as shown in Figure 4. Process 1→2. At this time, the heat dissipation of the capacitor is:

$$K = G(h_1 - h_2) \quad (1)$$

(1) In the formula: Q_K – is the heat dissipation of the condenser, unit *w*; G – is the condenser air flo, кг/c; h_1, h_2 – enthalpy of air entering and leaving the condenser, J/kg;

Heat transfer is equal to:

$$Q_K = KF\Delta t \quad (2)$$

In the formula: K - heat transfer coefficient, units. $W/m^2\,℃$; F is the heat transfer area of the condenser, units. m^2; Δt - average temperature difference of heat transfer of the condenser, units. ℃. Let the temperature of the air leaving the condenser be: t_2, when using the condensed water as cooling water to cool the condenser, the heat dissipation of the condenser is divided into two parts: one part is the latent heat Q of evaporation absorbed by the evaporation of the cooling water, and the other part is air heating heat Q air, the air process in the condenser can be considered heated first at the same moisture content, such as process 1-3 per enthalpy hygrometer, and then the hot air absorbs the water vapor evaporated by the cooling water isothermally, and becomes 4 points on the enthalpy hygrometer. The above process 3-4. The enthalpy at point 4 is equal to the enthalpy at point 2. At this time, the heat dissipation of the capacitor is:

$$K = Q_{evaporation} + Q_{cooling} \quad (3)$$

$$Q_{evaporationя} = G(h_4 - h_3) \quad (4)$$

$$Q_{air} = G(h_3 - h_1) \quad (5)$$

$$Q_K = Q_{evaporation} + Q_{air} = G(h_4 - h_3) = G(h_3 - h_1) \quad (6)$$

$$Q_K = Q_{evaporation} + Q_{coolingя} = G(h_4 - h_1) \quad (7)$$

The more heat Q of evaporation is absorbed by the evaporation of cooling water, the less heat Q of air is used to cool the air, according to the heat transfer equation:

$$Q_{air} = KF\Delta t_m \quad (8)$$

In the formula: Δt_m - is the average heat transfer temperature difference of the condenser, the unit is °C, since the Q of the air decreases, the heat exchange area and the heat transfer coefficient remain basically unchanged, so Δt_m decreases, so the condensing temperature decreases and the condensing temperature decreases. The air conditioning compressor capacity is reduced and the cooling capacity is increased. Increasing the cooling capacity further reduces the overall energy consumption of the air conditioner.

A number of textile enterprises are being created in our republic on the basis of foreign investments. In particular, in 2016-2018. in Andijan, together with China, a spinning

SJIF Impact Factor 2022: 8.197| ISI I.F. Value:1.241| Journal DOI: 10.36713/epra2016 ISSN: 2455-7838(Online)
EPRA International Journal of Research and Development (IJRD)
Volume: 7 | Issue: 5 | May 2022 - Peer Reviewed Journal

enterprise LLC "Bobur M&F" was established, which produces yarn from cotton fiber of the Sayro Ne12 and Ne16 brands. The company constantly monitors the production of quality products that meet international standards.

A number of textile enterprises are being created in our republic on the basis of foreign investments. In particular, in 2016-2018. in Andijan, together with China, a spinning enterprise LLC "Bobur M&F" was established, which produces yarn from cotton fiber of the Sayro Ne12 and Ne16 brands. The company constantly monitors the production of quality products that meet international standards.

CONCLUSION

Textile factory air conditioning can provide an ideal production environment for textile production, while the energy consumption of textile industry air conditioning accounts for the majority of textile energy consumption. How to reduce the energy consumption of air conditioning is an important issue in the textile industry. Over the past few years of industrial practice, our department has studied some experiences and ideas that have been effectively implemented and have good energy-saving effects. Enterprises continue to modernize and transform. In order to reduce energy consumption as a key improvement project, we undergraduates need to strengthen equipment management and technology innovation, make full use of the innovative capabilities of the relevant technical staff, and continue to explore new ways of energy saving in textile air conditioners for a long time.

REFERENCES

1. *Евразийский Химический Рынок. Умный текстиль // Polymery.ru[Электорнный ресурс]*
2. *Геллер, В.Э. О возможности получения нанокомпозитных текстильных нитей [Текст] / Геллер В. Э. // Химические волокна - 2013г., N 2.*
3. *Кричевский, Г.Е. Волокна прошлого, настоящего и будущего. Выбор пути - не простая задача // статья Г.Е.Кричевского, д.т.н., проф. [Электронный ресурс].*
4. *Баркалов Е.В., Карпис Е.Е. Кондиционирование воздуха в промышленных и жилых зданиях. -М.: Стройиздат, 1971. -269 с.*
5. *В. В. Шичкин, М. Н. Жерлыкина, С. А. Яременко, С. А. Соловьев. Разработка адаптивной вентиляции в многофункциональных больших пространствах общественных зданий. DOI:10.36622/ВСТУ.2021.19.4.002.*
6. *D.A. Avsyukevich. Эксергоэкономическая модель центральной системы кондиционирования воздуха. March 2017. Magazine of Civil Engineering 67(07):22-30. DOI:10.5862/MCE.67.3.*
7. *А. Н. Карсакбаев, А.Д. Золотов. Адаптивная система управления системой кондиционирования воздуха в помещении. январь 2021 г. DOI:10.53364/24138614 2021 22 3 82.*
8. *М.А. Бакулин. Последствия воздействия загрязненного воздуха на здоровье людей. December 2021. DOI:10.36684/53-2021-1-52-56.*
9. *И.О. Косяков, Автоматизация однозонального кондиционера мобильного комплекса с регулируемой производительностью. October 2020. DOI:10.48081/ADLK5505.*
10. *А.В. Дорошенко, К.А. Ржесік, М.В. Гордієнко. Новые возможности испарительных охладителей для энергетических и холодильных систем. December 2013. Refrigeration Engineering and Technology 49(6). DOI: 10.15673/0453-8307.6/2013.32667.*