Design and research of central air conditioning air purifier

Qingqing Zhang*, Zhiqiang Wan
Anhui Technical College of Mechanical and Electrical Engineering, Wuhu, Anhui, China

*0120160005@ahcme.edu.cn

Abstract. Central air conditioning type ultraviolet light air purifier, its sterilization and disinfection is mainly through ultraviolet sterilization. Ultraviolet rays penetrate the cell membranes of various microorganisms, and destroy their DNA structure, resulting in the destruction of their nucleic acid molecular bonds, so as to achieve a variety of bacteria or immediately die or reproduce the purpose of the offspring.

Keywords: Air pollution, air purification, purifiers

1. Introduction
With the continuous improvement of people's living standard, the corresponding health requirements are also higher and higher. The indoor air quality of our daily life and work is closely related to our health, and the requirements of indoor air quality are constantly improving. At the same time, the use of a large number of new materials for interior decoration, the further development of modern industry and the use of more and more chemical materials make the contact between various harmful gases in the indoor environment and people gradually increase. At the same time, due to the support of the concept of building energy conservation, indoor building space tends to be more and more airtight, and the exchange of air between indoor and outdoor is less and less, which leads to the accumulation of various harmful substances indoors, which leads to indoor air pollution. At present, indoor air pollution has attracted extensive attention from people, and air pollution is regarded as the third major type of pollution after "coal smoke" and "photochemical smog" pollution [1].

Polluted indoor air can be understood as: the introduction of indoor pollution sources that can release a variety of harmful substances, or due to poor indoor ventilation, the amount and types of harmful substances in indoor air continue to increase, and cause a variety of uncomfortable symptoms of people [1].

An adult needs to breathe more than 20,000 times a day, inhaling about 15 to 20 cubic meters of air. The polluted air will have a direct impact on human health. When the concentration of pollutants in the air is high, it will worsen the condition of the disease, or even cause acute poisoning, which will kill people when it is extremely serious. Of course, if the pollutant concentration is not high, long-term breathing of this air will also cause a variety of respiratory diseases and respiratory infections, such as chronic bronchitis, bronchial asthma, emphysema and lung cancer and other diseases.

Air pollution in the usual sense generally refers to outdoor air pollution. China's air pollution control work began in the 1970s, when it was mainly aimed at closing down the sources of industrial pollution and reducing pollution through emission reduction. With the continuous development of The Times, now people are more and more aware of the importance of clean air, from the current national major cities in the weather forecast on the importance of pollutants, can show that people on their own living...
environment of the air has reached a considerable degree of attention. In fact, now indoor environmental pollution than outdoor environmental pollution to people's health as more serious harm. The existence of a large number of viruses, bacteria, particles and harmful substances in the polluted air is increasingly serious and lasting damage to people's health, especially for people living in such a polluted closed indoor environment for a long time.

According to the statistical results of relevant international organizations, more than 30% of the buildings in the world emit air harmful to health [1]. The World Health Organization (WHO) and relevant Chinese authorities also have evidence that health problems caused by indoor air pollution are becoming more and more serious. In the investigation of the new office building, 14 kinds of VOC, such as aliphatic hydrocarbon, aromatic hydrocarbon and halogenated hydrocarbon, were detected in the air of the building. The content of indoor air reached 1299μg/m3 in July, while that of outdoor air was only 25.5μg/m3. All these proved that indoor VOC pollution was very serious. In recent period of time, many departments of the country discover in joint investigation, in all decorate material, indoor decorate material to exist poisonous gas pollution account for as high as 68%, all sorts of volatile organic compound in these materials have 300 kinds of much actually. Among them, there are organic compounds such as formaldehyde, benzene and ammonia which are obviously harmful to human body. Air conditioning systems, building decoration materials, office equipment and household appliances are the main "hidden killers" of indoor air pollution [2]. A large number of testing data show that in recent years, China due to indoor chemical, physical, biological pollution hazards aggravation, caused by a variety of related cases increased a lot, the situation of collective outbreak is more and more.

According to investigation, our country uses at present major interior decoration material to contain organic solvent, formaldehyde, benzene, radon, ammonia to wait in different degrees. Formaldehyde is a colorless and soluble irritant gas, mainly exists in artificial boards, adhesives and wallpaper, the release period can be as long as 3~15 years. Long term inhalation, it can cause people nasopharyngeal cancer, throat cancer and other serious diseases. Benzene, colorless gas with a special aromatic odor. Mainly from paint, glue, coatings, adhesives. It can cause nerve anesthesia, inhibit hematopoiesis and even cause birth defects in the fetus. Radon is an imperceptible, odorless, colorless, inert gas. It mainly comes from cement, ceramic tile and other building materials, can form internal radiation to people, induce lung cancer, leukemia and respiratory disease. Radon is second only to smoking as a hazard to human lungs. Ammonia, a colorless gas with a strong pungent odor, mainly comes from the antifreeze of concrete and the flame retardant of fire boards. It can cause edema, congestion, dermatitis and other diseases both through the skin and respiratory tract. In addition, inhalable particulate matter can also have a great impact on human health and ecological environment [2]. Studies have shown that fine particulate matter with diameter less than 2.5 microns will increase the prevalence of serious diseases and the mortality of patients with chronic diseases, worsen respiratory and heart diseases, affect lung function and structure, immune structure and so on. Even if the indoor single VOC content is lower than its limit content, but because of the existence of multiple VOC mixture, so that its harm greatly increased. Modern architecture and decoration make this situation much more harmful to people's health.

With the development of industry in our country, indoor pollution is taken seriously by people gradually. Especially in the late 1990s, with the rise of housing reform and construction, indoor pollution caused by decorative materials followed. With the use of air conditioning, the building structure is more and more airtight. In addition, insufficient fresh air volume of air conditioning further caused the deterioration of indoor air. For large workplaces, due to the large number of people and long-term closure, the corresponding harm is greater. This situation reminds us that we must pay attention to the prevention and control of indoor air pollution. Whether it can be effectively solved is not only a concern of people, but also an important topic in environmental protection technology.

2. The development status of indoor air purifier
Air purification technology is a new comprehensive science and technology gradually formed with the continuous development of modern industry. Global air pollution has led many countries to study this topic, and achieved certain results, the formulation of air quality standards, testing standards and analysis
standards. Many countries have developed many types of detection, collection and purification equipment, China has also developed a variety of air purification devices. But there are all kinds of problems with the design concept, use and effectiveness of these devices. This situation calls for the continuous development of new easy-to-use, technologically advanced, economical and effective equipment. At present, effective methods to improve indoor air quality include source control, ventilation and air purification [3]. Source control is a way to improve air quality by controlling the source of air pollution. It is an effective way, especially in the control of outdoor air pollution. In our country, there is still a long way to go with the development of economy. Ventilation is to strengthen the flow of indoor and outdoor air, thereby reducing the concentration of indoor pollutants. This way is simple and easy to go, but the reduction degree of all kinds of pollutants is not different, and depends on external conditions and ventilation air conditioning devices. Air purification is similar to ventilation, on the basis of which the polluted air reduces pollutants and purifies granular substances. It has high efficiency and reliability for large solid pollutants. Air purifier is the most direct and convenient equipment for indoor air purification. There are many kinds of ways, mainly divided into dust removal type and degassing type, dust removal type is divided into scenic spot type and filter type. The effect of these two methods is not very good at present, and most of them are used as auxiliary means. The principle of degassing type is more. Common methods have physical adsorption, chemical adsorption, ozone oxidation, plasma method, ventilation ventilation, ventilation, feeling deodorization and biological methods. Each method has its own advantages and the degree of application development is also different. Sterilization methods include: high temperature drying sterilization, high pressure steam sterilization, gas sterilization, filtration sterilization, radiation sterilization, etc., disinfection methods include: boiling and atmospheric pressure steam disinfection, low temperature disinfection, ultraviolet radiation method and chemical disinfection method, many methods have their own advantages.

3. Conclusion
The main function of central air conditioning air purifier is to improve indoor air quality. The UV-light central air conditioner air purifier studied in this paper can capture a very wide range of pollution sources, including bacteria, fungi and even viruses. With the air flow in the air conditioning, the polluted air first through the air filter in the machine (two filtration) to make all kinds of pollutants are removed or adsorption, and then through the ultraviolet light tube sterilization (sterilization of ultraviolet light produced at work), to achieve the purpose of cleaning and purifying air.

Central air conditioning air purifier is widely used, not only can be applied to office, home and other indoor purification, but also used in medical institutions such as hospitals and hotels, entertainment clubs and other working environments. The central air conditioner air purifier has complete functions and good performance. Through electrostatic adsorption, ultraviolet ray and filtration, not only the dust carrying bacteria in the air can be removed, but also the absorption of microorganisms [5]. According to the experimental results, the number of bacteria after disinfection is in line with the national standard, and the air can be continuously disinfected. The number of bacteria in the air was not significantly increased after the detection of the personnel who worked in the places with multiple bacteria into the working room where the central air conditioning air purifier was installed. The number of bacteria and other indicators were also low as the national standard for disinfection of the asepsis room. The disinfection of central air conditioning air purifier has no side effects on people's health and no special requirements on environmental conditions. It can be used in a wide range of environments and realizes the coexistence of people and equipment.

References
[1] SUN Qin. Optimization Design of Power Supply for Indoor Negative Ion Air Purifier with Electrode Heating [D]. Dalian: Dalian University of Technology 2007
[2] Jiang Anxi. Air Pollution Control [M]. Chemical Industry Press, 2003:255-262
[3] Lou Shan Forest. Development of a New Anion Air Purifier [D]. Dalian: Dalian University of Technology, 2006
[4] Wu Zhongbiao, Zhao Weirong. Indoor air pollution and purification technology [M]. Chemical Industry Press, 2005:2-11
[5] He Delin. Air Purification Technology Manual [M]. Publishing House of Electronics Industry 1985:244-245