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Research on Design Method of Building Energy Saving and Temperature Control

Mengqi Zhou

Wenzhou Polytechnic, Wenzhou, 325035, China

784779975@qq.com

Abstract

More and more attention has been paid to the comfort of indoor space, and the technology of indoor temperature control has gradually matured. However, at present, the manipulation of temperature depends on the way of burning resources or destroying the ecology to maintain indoor temperature. This way of application will consume a lot of energy, although it meets the requirements of temperature, but it is not conducive to long-term development. Nowadays, many countries are exploring how to reduce pollution, how to save energy consumption, this paper through the use of new technology and new technology and local climate resources to combine, design and develop a set of indoor low energy consumption temperature control method, strive to achieve in the energy conservation and environmental protection on the basis of maintaining indoor constant temperature.

Keywords

Architecture; Energy Saving; Design.

1. Introduction

With the development of human society, human beings have changed from the arrangement of subjecting to nature to the transformation and conquest of nature, and the requirements for indoor space are beyond the limit of survival. Human beings have more positioning for living space, such as practical, safe, beautiful and comfortable, and more aspects of design and functional demands are given to architectural space. With the development of science and technology and the improvement of people's living standards, people pay more attention to the comfort of space use in terms of indoor layout and design. In addition to the basic requirements of indoor lighting and sound control, people began to change the internal settings of the building space through various technical means, especially in cooling, heating, ventilation, hot water supply, lighting and other aspects. The extensive application of electrical equipment makes the living environment meet the requirements of comfort in local space, but the improvement of comfort also brings a wider range, even the world Environmental problems and ecological crisis. Because human beings rely too much on scientific and technological products to improve the comfort of indoor space, the architectural design is reduced to the dilemma of being "kidnapped" by science and technology. The interior design generally relies on artificial heating, cooling, ventilation, lighting and other equipment, so that the consumption of energy in the use of buildings has reached an unprecedented level. The construction industry and its equipment related supply sector occupy a large share in China's industrial development, and the resulting resource consumption and ecological environment are worrying.

The design method of building energy conservation and temperature control studied in this paper is essentially a naturalistic design position, which emphasizes the use of natural factors such as climate, making the design itself return to nature, and on the basis of improving the comfort of indoor space, minimizing energy consumption, protecting the environment, and

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forming a harmonious relationship between human and environment. Cooling and heating are basically the control of temperature, and the temperature is determined by the amount of heat. Therefore, controlling and handling the heat source can achieve the effect of temperature control.

2. Research Status of Building Energy Saving Design

The research on the design of energy-saving and temperature control system of indoor space has related literature at home and abroad. In architecture without architects by Bernard, a great master of foreign architectural thought, the proper combination of regionalism traditional architecture and environment in different places not only prints the "regionalism" style, but also gives new ideas to ecological architecture. After that, Ken Yeang and Ford put forward the research method and frame design theory, and applied it in practice. They applied the passive design strategy to green skyscrapers in different regions under different climate characteristics, and controlled the indoor microclimate by technical means. Corya is an Indian architect, starts from the traditional architecture of his country and proposes to create a comfortable indoor environment from the plane and slope. He emphasizes the design means of introducing climate resources instead of putting the responsibility on the mechanical engineers. Corya pays attention to the methods and Strategies of coping with climate problems in local buildings, such as the sunshade and cooling method of erecting scaffolding on the roof of traditional Indian buildings, and the "chimney effect" is formed through the pyramid shaped section design to strengthen ventilation. Egyptian designer h. Fathy attaches great importance to the use of natural environment protection technology and natural ventilation. Through a detailed study of the local temperature and wind, a series of airflow refraction devices are introduced in the design to improve the wind speed and indoor ventilation in desert areas. In the design practice of H.Fathy, the structural principle of traditional architecture is also used for reference. Thick brick wall and courtyard structure are used to adjust the climate to achieve the purpose of indoor cooling. In the aspect of indoor temperature control design, Givoni and Synnefa are committed to the research of water heat insulation, and put forward the concept of "roof pool", which is used for indoor cooling and heating. In his book passive and low energy cooling of buildings, Givoni is an internationally famous expert on ecological architecture and professor of the University of California, made a classified study on passive cooling of buildings.

Domestic research on indoor energy saving and temperature control is also concerned by architects, interior designers and mechanical engineers. In 1982, Professor Daozeng Li published the article "attaching importance to the application of ecological principles in planning" in "World Architecture", which started the widespread concern of Chinese architects on ecological issues. Domestic scholars began to systematically study ecological energy conservation, and put forward a series of strategies and theories of ecological energy conservation building based on China's climate and regional characteristics, including Academician Liangyong Wu of Tsinghua University Professor Baofeng Li and Xianjue Liu of Southeast University, Professor Zengtun Fang of Northeast Normal University. In his introduction to human settlement environment science, Liangyong Wu will focus on the coordination between human and nature, and discuss the relationship between nature and human settlement environment from five aspects of ecology, economy, technology, society, culture and art. In Zhang Lian's book "the world's traditional residents an ecological house", through the study of different forms of dwellings around the world, it tells us that the ingenious construction methods and the use of regional materials of dwellings are related to the local natural climate and environment.

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3. Development Trend of Building Energy Saving Design

At present, in order to control the indoor temperature, a lot of energy is used in exchange for environmental comfort, which not only brings the energy crisis, but also brings the urban heat island effect. The most widely used indoor cooling method is the use of air conditioning, and the air supply pipeline of air conditioning is the medium of spreading bacteria, which is not conducive to health. For example, this year's new coronavirus spread all over the world. At this time, the temperature control of air conditioning will cause the spread of the virus, and the method of temperature control of air conditioning will show its disadvantages. In addition, for the ecological environment of people's daily life, mechanical refrigeration undoubtedly increases the pressure of the environment. Therefore, domestic and foreign indoor space energy saving and temperature control are looking for more economical and widely applicable new system. Many kinds of energy-saving and temperature control buildings have been successfully built all over the world. The temperature control system has its own unique design method according to the regional climate and natural environment, which is respected and favored by users all over the world.

From the domestic situation, China has a vast territory and great regional cultural differences. The design should reflect the climate differences, and the design based on the specific climate conditions is a feasible way to reflect the regional characteristics of architecture. The arcade buildings in southern China, the dry fence buildings in hot and humid areas, the caves in northern China, and the "one seal" of Yunnan folk houses are all derived from the characteristics to adapt to the climate conditions The whole process of temperature control adopts the original way of low energy consumption. In the domestic traditional architecture, the method can be inherited. In the new architectural design, there are many research cases for the indoor energy-saving and temperature control system, such as Landsea international block, it is the model house design in SuZhou. The indoor energy-saving and temperature control system is a good design case. After that, all over the country are exploring and building regional energy-saving and temperature control interior space, which has been sought after by interior designers and architectural designers in recent years.

4. Energy Saving Design of Wenzhou Residential Buildings

ChaShan is located in OuHai District of Wenzhou, relying on DaLuo mountain, which has been approved as a provincial forest park. The beautiful environment and clear spring nourish generations of ChaShan descendants. There are many traditional Wenzhou residential buildings in ChaShan area. Until 2000, Wenzhou Higher Education Park chose to build in ChaShan area, more people began to understand the residential buildings in ChaShan area.

4.1. Architectural Form of Folk Houses

After years of renovation and construction, the existing residential buildings in ChaShan retain the traditional architectural form and add modern architectural flavor, as shown in Figure 1. The traditional one floor building is rare, but more two to three story buildings. Most of the buildings are single, and one is a family. Taking the traditional three stories building as an example, the first floor is set up as kitchen, dining room and storage room, the second floor is set up as multiple bedrooms, the third floor is mainly composed of living room and guest room, and the third floor is generally equipped with an open balcony. The balcony area is large, which is convenient for air drying activities. The lighting of the first floor of the building is poor, but it is very cool in summer. Local people like to open the door of the first floor, or sit at the door to chat or activities in the courtyard. The ventilation effect of the one floor indoor space is excellent. The daylighting of the second floor is better, the indoor temperature is more constant in a day, it won't be too cold in winter, it won't be too hot in summer, so the master bedroom is

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mostly designed on the second floor. The third floor is the top floor of the building, with the best lighting effect. Generally. The work of drying clothes is usually carried out in the space on the third floor. However, because the space on the third floor is the top floor of the building, the heat dissipation of the indoor space is faster in winter, and the indoor space is very muggy in summer, so the top floor is more used for indoor play activities.

Figure 1: Architectural form of folk houses

4.2. Design and Analysis of Energy Saving and Temperature Control System

The preservation of traditional residential buildings is a valuable resource of the tea mountain culture. The tea mountain area can rely on the DaLuo mountain scenic area to create local characteristic buildings. Although the existing buildings retain the traditional architectural form, the integration of modern equipment destroys the charm of the building itself. The application of equipment is to achieve indoor livability. If unnecessary equipment can be abandoned to achieve livable effect, the original posture of the building can be protected, and the harmony between the building and nature can be achieved. Starting from the indoor cooling, this paper tries to find a new way to build a new energy-saving residence in ChaShan.

Because of its back to DaLuo mountain, the temperature in ChaShan area will be slightly lower than that in Wenzhou City, and the rivers are densely distributed, which makes summer cooler. With the large-scale application of all kinds of temperature control equipment, the urban heat island effect is aggravating. Air conditioning is also widely installed in ChaShan area, which makes the overall temperature rise. The application of air conditioning not only destroys the natural environment, but also destroys the local cultural building landscape. This paper attempts to create an energy-saving cooling system by using river resources. According to the data, the water temperature of the river is about 21 ℃ in summer. If the water resources in the river are used for indoor physical cooling, there is no need to use air conditioning in summer. The design is divided into four parts, as shown in Figure 2. The first part is the pipeline design, which connects the river channel and the building interior. In the second part, deoxidized water is added into the pipeline to make it circulate naturally in the pipeline. In the process of circulation, the temperature of the water body decreases after passing through the river. The low-temperature water body is transported to the building pipeline to absorb the indoor heat and achieve the effect of indoor cooling in disguised form. The second part focuses on the pipeline water body to be free of impurities, so that it can better absorb and release heat, and there will be no blockage or deterioration. The third part focuses on the power equipment, design in the underground space, reduce the damage to the ground building landscape. The fourth part is to build an energy storage box. The low temperature collected at night is stored in the underground energy storage box. When the temperature rises, the energy storage box will be opened automatically to achieve the indoor constant temperature effect. The fourth part of the difficulty is mainly in the selection of materials, and strive to find materials with good energy storage effect. At this stage, the ideal materials are disguised materials, which absorb or

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release a lot of heat through the disguised process. There is no other material production in the process, which is both energy-saving and environmental protection.

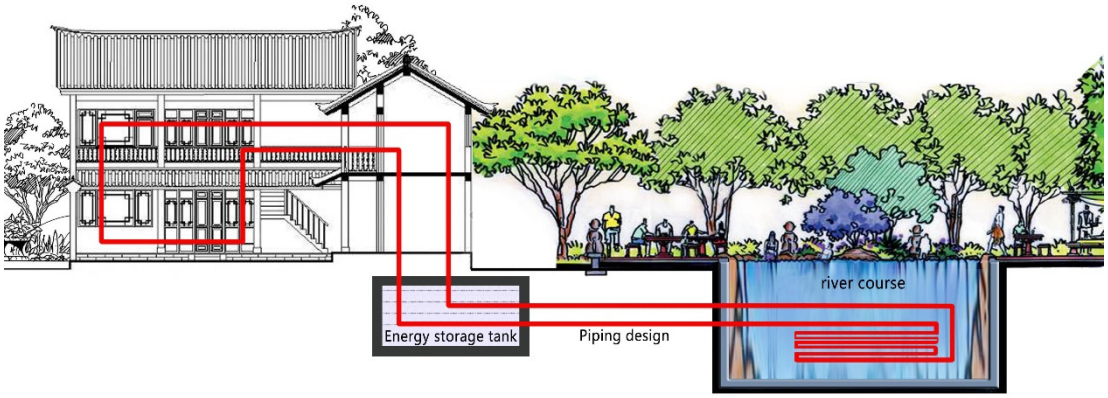

Figure 2: System structure diagram

5. Conclusion

In this paper, the energy-saving system is designed by the combination of regional climate and technology. The innovation of the design is to use the river resources in Wenzhou area, connect with the indoor temperature control system, and create a natural temperature control system instead of using air conditioning and other equipment for temperature control. The new system can control the indoor temperature at the same time, create environmental protection and green indoor space concept. In the process of using the system to achieve the effect of energy saving, for the future urban development is worthy of in-depth study. Theoretically, this concept can be used to create indoor low energy consumption and constant temperature space with regional characteristics in all parts of China. The research of this project has high practical application value and market promotion value, and can achieve the national energy conservation after extensive implementation.

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