

Design and energy saving analysis of air conditioning system based on building environment

Guoxing Wang ¹, Zheng Lian ², Yunting Deng ³, Zhonghua Zhang ⁴, Tao Lv ^{4,*}

¹ Xuhai College of China University of Mining and Technology, Xuzhou, Jiangsu, 221008, China

² School of Electrical Engineering and Automation, Henan Polytechnic University, Jiaozuo, Henan, 454003, China

³ School of Business for Anhui University of Technology, Ma 'anshan, Anhui, 243002, China

⁴ School of Architectural Engineering, Anhui University of Technology, Ma 'anshan, Anhui, 243002, China

*Corresponding author: 2391745180@qq.com

Abstract

With Chinese economy, education, culture, science and technology, architecture and other aspects of comprehensive progress in the background of The Times, more and more families began to use air conditioning to control the temperature difference of the building environment, improve the comfort of the living environment. But in the process of a large number of applications of air conditioning, this will inevitably make people suffer from "air conditioning disease", and will cause unnecessary waste of resources. Based on this situation, air conditioning system designers need to improve some of the details in the design of air conditioning, to ensure that the design of air conditioning can follow the needs of social development and progress together, reduce electricity consumption and use, control the waste of resources.

Keywords

Air conditioning system; Design optimization; Skills to reduce emissions; Environmental protection.

1. Introduction

The design level of air conditioning system determines the consumption of electricity and the efficiency of air conditioning. This has a very important role in the brand image of air conditioning itself, which also determines the market share of air conditioning brand. But at the present stage, most air conditioning designers ignore the matching of the built environment and air conditioning design, and they only add energy-saving and environmental protection mode on the design level. If users do not choose this mode, the environmental protection significance of air conditioning energy consumption reduction will be greatly reduced, so as to achieve the sustainable development strategy called by the state. When the outdoor temperature is higher than 20 degrees Celsius, the power consumption of 1P air conditioner is about 17 to 20 degrees Celsius a day. An electric fan, on the other hand, needs only 10 percent of the power it consumes, and an ordinary refrigerator, on the other hand, needs 50 percent. From the comparison of data, it can be seen that air conditioning consumes high power. If relevant designers do not optimize the design of air conditioning, it will be difficult to increase the competitiveness of the brand in the market.

2. Analysis of building environment to energy saving design factors of air conditioning system

2.1 External environmental factors

The main reason why people turn on air conditioning is that the indoor temperature is too low or too high, and the main factor that determines the indoor temperature is the outdoor temperature. In China's meteorological report for the first half of 2020, we found that the temperature in northern China this year was 27% higher than previous years, while the temperature in southern China only increased by 5%, but the rainfall increased by 32.52% compared with last year [1]. Compare this year's data with the 1990 observations, and the magnitude of the change is even greater. The main causes of this problem are global warming and China's rapid urbanization without adequate environmental protection measures. This has led to the extreme change of outdoor atmosphere in China in recent years. In the forest areas with rich vegetation, the outdoor temperature is relatively constant throughout the year, and air conditioning is generally not used in these areas. Even if people use air conditioning, it is mostly because they want to ventilate the indoor environment [2]. To this end, designers should take into account that air conditioning needs to face outdoor environmental factors. According to the temperature conditions in different regions to design different types of air conditioning, and then in the actual situation to improve the environmental protection ability of air conditioning, promote energy conservation and emission reduction.

2.2 Factors of building greening

Green plants around the building can help air conditioning to share the pressure of temperature regulation, green plants can effectively absorb the sun's radiation, reduce the temperature around the building, which also makes the work of air conditioning can further close to people's life. At present, the external walls of many buildings in China are used as insulation panels. The biggest advantage of this kind of building material is that it can prevent heat in summer and keep heat in winter. But its disadvantages are also obvious, it will spread the sun's heat radiation around, thereby affecting the temperature environment, making the surrounding of the building warmer than other locations. And air conditioning units are generally placed in the distance from the building, which brings a certain burden to the air conditioning work. If vegetation is planted all around the building, the heat can be effectively absorbed and the power loss of air conditioning can be reduced [3].

2.3 The internal environmental factors of the building

It is far from enough for designers to only consider the impact of the external environment of the building on air conditioning. Designers also need to consider the internal factors of the building, so that the air conditioning system can meet the actual needs of more people. In buildings, the thermal insulation of the roof will form cold and heat load, which will affect the indoor heat dissipation speed to a large extent. Therefore, designers should pay attention to this point in the air conditioning of northern areas, so as to save electric energy of users and improve the temperature control effect of air conditioning [4]. In addition, air conditioning designers should take indoor temperature and humidity as one of the main factors in air conditioning design, so as to avoid high indoor temperature bringing hot and dry sensation to users, and low temperature bringing wet sensation to users. For the setting of air conditioning state at night, the temperature had better be kept between 22°C and 24°C, because the rest and sleep state of human beings in this interval is the best, and will not be easily disturbed. At this stage, each will be installed in indoor wireless connection equipment, air-conditioning designers can seize this, each adding single chip microcomputer to air conditioning, actually be able to upgrade the software, with the support of the single chip microcomputer, designers can also increase indoor temperature humidity sensor, the initiative to feel the indoor environment, the indoor environment is relatively good condition to reduce the temperature control, Increase the ventilation circulation to reduce the power consumption of air conditioning [5].

Table 1: The impact of environmental factors on air conditioning design

influence factor	main performance	design impacts
external environment	influence the temperature of indoor environment, increase power consumption, challenge the performance of air conditioning	different types of air conditioning are designed for different areas
building greening	increase temperature regulation pressure, waste resources control, bring work burden	it is necessary to consider the effect of outdoor emission temperature on external air conversion
indoor environment	temperature and humidity balance, comfort zone determination	add intelligent technology, information technology, remote control technology

3. Energy-saving design optimization strategy of air conditioning system based on building environment

3.1 Lower the original indoor setting

Human comfort is in a specific rated range. This zone needs not only the right temperature, but also the air humidity and ventilation to provide a complete comfort zone. If this goal is not reached, many people will feel "uncomfortable environment", and then continue to change the setting temperature of air conditioning, which will cause a transition waste of resources, not in line with the strategic goal of energy conservation and emission reduction. Therefore, designers should control the indoor setting value of air conditioning to improve the efficiency of air conditioning. In order to achieve the above requirements, designers must integrate confidence technology, remote control technology and integration technology into the design [6]. Specifically, the designers need to add a single chip microcomputer as the technical basis in the design, and then add a number of implementation sensors and small radio communication equipment. In the air conditioning installation, the installation personnel should connect the system to the Internet by user WLAN, connect the air conditioning manufacturer database through the system identification code, and then use all levels of sensors to sense indoor environment changes. The indoor environment is evaluated according to the data in the database. After comprehensive evaluation, an intelligent temperature control system is customized for users [7]. In addition, with the popularity of smart phones today, air conditioner designers can use smart phones to control equipment, which can not only reduce the production cost of manufacturers, but also meet the diversified control of users. At present, some domestic mobile phone manufacturers have launched these functions. Designers can set the air conditioning system as an open connection system, users only need to scan the TWO-DIMENSIONAL code, can be directly connected to the air conditioning operating system. At the same time, they can rely on smartphones to obtain geographical information and customer needs, and continue to optimize air conditioning Settings, which further reduce the loss of air conditioning. Designers can also develop environmentally friendly computing options to let users know how much electricity they will use if they increase the power of the air conditioner, and to encourage users to reasonably arrange the temperature and frequency of the air conditioner [8].

3.2 Optimize the air conditioning mode

In relation to the design of traditional frequency conversion air conditioning, the working mode can be selected according to user needs and gradually adjusted according to the indoor temperature, but this design increases the distress of "air conditioning is too smart" to users. Therefore, designers need to inherit the principle of heat source technology of traditional frequency conversion design, improve the energy saving details of air conditioning, and need to transform its semi-intelligent operating system into a fully intelligent operating system. To put it simply, the choice of intelligent system should be in the hands of users. Intelligent system can only provide reference opinions and adjustment opinions to help users budget the total amount of wasted resources in advance. Only in this way can it become an air conditioning brand recognized by users. Air conditioning manufacturers should actively deepen the intelligent system's control authority on air conditioning functions, help users

solve their life problems through continuous technological upgrading, so as to improve users' satisfaction with air conditioning products.

3.3 Optimization of water system

Optimize the design of air conditioning water system, adopt large temperature difference cooling system, adjust the flow of water system according to the end. Such as water pump frequency conversion, cooling tower fan frequency conversion and so on.

3.4 Optimization of wind system

Optimize the design of air conditioning system, using VAV (Variable Air Volume) instead of constant air volume system. Such as cold radiation ceiling, exhaust heat recovery.

4. Rational integration of natural and new energy sources

4.1 Analysis of the application of free cooling

In the use of energy, air conditioning designers should do their best to integrate natural resources with new energy technologies. In the traditional concept, the free cooling technology needs to rely on cooling tower, and the cold cooling tower needs water as a circulating coolant, by absorbing a large amount of heat to reduce the water temperature and then achieve the purpose of cooling. In the new situation of energy conservation and environmental protection, free resources become natural wind or other natural resources for cooling, through reasonable design to send cold air into the room. However, this natural cooling resource lacks stability and continuity, and cannot ensure the stability of indoor temperature for a long time. To do this, designers need to blend the two. When the natural wind or other cooling resources are stable, switch the air conditioner to the state of natural cooling. When the support of natural resources is lost, then the cooling tower work. In this way, we can achieve maximum energy saving. In addition, when using natural cooling resources, designers can leave cooling towers on standby and only circulate water to turn off heat absorption. After the natural resource cooling stops, the cooling tower can be directly put into use, thus avoiding the reduction of air conditioning control of room temperature.

4.2 Analysis of active development of new energy technology application

Air conditioning designers not only need to make rational use of natural cooling resources, but also need to increase the development of new energy technology and implement the details of energy conservation and emission reduction, so as not to be eliminated by the fiercely competitive industry. For example, some foreign top technical teams have been studying the application of solar air conditioning and battery capacity expansion in recent years. If these two technologies can make some substantial breakthroughs, not only the development direction of air conditioning will have a revolutionary change, but also the waste of air conditioning resources and other environmental energy-saving problems will be alleviated. Designers in related industries in China should also be engaged in the research and development of such technologies and play an active leading role. On the level of human progress with foreign scientists to complete technological innovation reform. Only in this way can our air conditioning design technology always maintain the world first-class level, no longer rely on foreign innovative technology support.

5. Conclusion

As the share of air conditioning in Chinese civil market increases year by year, users' experience of air conditioning and some detail requirements are also gradually improving. Designers must optimize their design concepts with the development of The Times, so as to improve the basic functions of air conditioning. Make air conditioning products more intelligent, humanized, information, integration, can adapt to more harsh environment, reduce the loss of electricity. From a large level, the air conditioning industry needs a large system revolution, so as to reduce the rate of global warming, and actively respond to China's sustainable development strategy.

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