Research on Energy Saving and Cost Saving Optimization Strategy of HVAC System

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Abstract: Because HVAC is widely recognized and used by the public, the main functions of general air conditioning are heating, ventilation and air conditioning. Generally used in thermodynamics, fluid mechanics, fluid machinery. That is the ultimate subject of mechanical engineering. In general, the system mainly controls air temperature and humidity to improve indoor comfort. Its biggest advantage is to save energy and cost. As many people use it, some shortcomings continue in the past, and the excessive consumption of energy shortens the life of HVAC. Only scientific and reasonable strategy can carry out the work of energy conservation. This paper promotes the energy-saving design of air-conditioning system, analyzes the energy-saving technology of HVAC and HVAC. This will improve people's quality of life and ensure an optimized environment.

1. Introduction

The combination of HVAC system and buildings plays an important role in improving people's living standards. However, in the context of increasingly severe consumption of resources in China, it is of great significance to carry out energy-saving and energy-saving air conditioning system. Therefore, relevant data shows that building energy consumption accounts for about 30% of China's energy consumption, among which HVAC system consumes the most energy[1]. Therefore, the optimal Countermeasures of energy saving and cost saving in heating, air exchange and air conditioning system must be the inevitable topic in the construction of ecological civilization.

2. Energy Saving Design of HVAC System

The whole structure of HVAC system itself is complex. Some working principles and basic components have some complexity. In addition, there are many types of systems. As we know, central air conditioning is the most direct reflection. Generally, in the design process, relatively simple data information is coupled to complex systems. This is to prevent data theft. The design is related to the performance of HVAC system. Mainly in terms of function and quality, the overall level of the system is determined by the function maintenance and quality during the user's use [1]. If every part of the system is designed to operate under overload, the energy consumption will be greater, and the effect of optimizing energy will not be realized effectively[2]. Therefore, if you want to optimize energy, it is necessary to carry out systematic energy conservation from the technical aspect. First of all, establish the analysis strategy research model to achieve the purpose of energy conservation.

Table 1 Comparison between eneryplus and DOE-2

Project	EneryPlus	DOE-2
Computing method	Integrated synchronous load system equipment simulation	Sequential load system equipment simulation
Load simulation	CTF combined with heat balance method	Transfer function method
System simulation	System structure can be adjusted	Non adjustable system structure

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Natural draft	Simulation	Impossible to simulate
Wall wetting	Simulation	-

2.1. Necessity of Energy Saving Research of HVAC System

Energy is an important material foundation for economic development. With the acceleration of people's life rhythm and the continuous improvement of people's requirements for the quality of life, the problem of energy consumption is becoming increasingly serious, and energy consumption has become one of the main factors affecting social development[3]. In particular, energy consumption only accounts for more than 40% of the total social consumption. Therefore, under the environment of constructing ecological society, it is necessary to strengthen the research of building energy consumption. At the same time, the contradiction of power supply is more and more obvious in the environment. In order to alleviate the problem of power shortage in our country, the viewpoint of energy saving should be started. Taking the north building as an example, the energy consumption of HVAC application in the north building is mainly power equipment, while the main power sector in the north area relies on coal resources for power generation. Therefore, the means to support the operation of HVAC will lead to the deterioration of China's environment.

2.2. Problems in HVAC System

In order to achieve the energy saving of HVAC, it is impossible to improve it only by a certain technology. First of all, change the structure of the building, by improving the structure of the building, reduce the energy consumption of the building[4]. For example, the outer wall of a building can be insulated to increase the dependence of the building on energy consumption. The second is to optimize the air conditioning system and the internal technology of the air conditioning system. Considering practical factors, it is impossible to reduce the structure of buildings, and the consumption of capital is relatively large. Therefore, we mainly start from improving HVAC technology. However, in the operation of China's air conditioning system, there are generally "two lowest and one high", that is, low load rate of hot and cold water pump, low working efficiency of the system and large energy consumption. The reason is, first of all, the defect of design[5]. During the design of HVAC system, the power of HVAC is usually set according to the maximum power (i.e. the overall operating conditions of HVAC), but in fact, the applicable proportion of HVAC is less than 80% In cases, most of the operations are non operational. HVAC system realizes automatic control system, but the control is mainly reflected in the host and some terminal equipment. The central air conditioning has not been automatically controlled. Third, the air conditioning control system is lazy in controlling heating, but also pay more attention to meet the actual needs. Air conditioning energy saving control

3. Measures for Energy Saving and Cost Saving Optimization of HVAC System

The energy consumption of air conditioning system is mainly reflected in air circuit and cold water circuit. Therefore, in order to realize the energy-saving of air-conditioning system, it is necessary to mainly calculate the combination form of variable air volume and variable water volume in the air-conditioning system to realize the energy-saving.

3.1. Modify the Working Parameters of HVAC System

First, change the temperature of the supply air. Generally, when the design temperature of the air conditioner does not change in the external environment, the supply air temperature is inversely proportional to the supply air volume. When the supply air temperature is high, the air volume of the air conditioning system will be smaller, so this problem can be solved, and the supply air temperature can be changed to achieve the energy saving of the air conditioning system. After a series of studies, when the temperature of HVAC air supply is 11.37 ℃, the total power of HVAC system is the smallest, so we must design the air conditioning system at 11.37 ℃[6]. The temperature of the water at the inlet and outlet of the surface Kula is inversely proportional to the

flow rate of the frozen jadeite water. The optimal temperature of the inlet and outlet water of the surface cooler is 4.12 ℃, and the flow of the uncontrollable chilled water is 24.10 kg / s. Refrigerator technician HVAC runs the largest energy consumption Department of refrigerator is the center of HVAC. Therefore, in order to realize the energy-saving of air-conditioning equipment, improve the operation technology of the refrigerator, and improve the efficiency of the refrigerator is very important. The main factors that affect the operation efficiency of refrigerator are the temperature of water outlet and the temperature of cooling water. Therefore, when the temperature of cooling water does not change, the temperature rise at the outlet of the refrigerator is the key to improve the energy saving of HVAC. The working efficiency of general refrigerator is maximized, and the emission control temperature of refrigerator is 5.84 ℃.

3.2. Establish HVAC Cost Saving Measures Based on Power Demand Response

In order to ensure the power consumption of residents and improve the power efficiency, the peak load and valley filling system to reduce the power load is established. That is, when the power consumption reaches the peak, the power price is relatively high, while when the power consumption is low, the power price is relatively low. The energy-saving and saving type of HVAC is not based on the energy consumption of energy-saving countermeasures, but through reducing energy consumption, reducing the operation cost of HVAC and reducing the operation cost of HVAC. Therefore, it is very important to establish air conditioning support strategy based on power demand response. According to the indoor temperature setting value, change the cooling load curve of the air conditioning system. On the premise of ensuring comfort, the cooling load curve of HVAC is effectively changed, and the purpose of peak cutting and valley filling is achieved[7]. All in all, the air conditioning refrigeration device based on the power demand can reduce the economic cost of users, and perform the power consumption HVAC operation mode according to the high power consumption and low power consumption mode. It can save a lot of national funds and energy, more importantly, it has made a significant contribution to national environmental protection reasons, such as reducing pollutant emissions, reducing power consumption.

3.3. Actively Install New Energy-Saving Technology and Equipment

The continuous development of HVAC system technology accelerates the development of HVAC device, especially the innovation and development of HVAC core. For example, the current very common frequency conversion technology is the application of advanced technology, and is a typical case of HVAC system. Frequency conversion technology has effectively changed the non electric energy consumption of HVAC. Therefore, in order to achieve low energy consumption through technological innovation, it is necessary to actively apply advanced technology and equipment for innovation. At the same time, in the operation of HVAC system, we must actively apply renewable resources, such as solar energy, wind energy and other energy to heating. In air conditioning, compared with the advanced countries, China's energy-saving technology of HVAC system is still relatively backward. Therefore, our technology is based on independent innovation. It is necessary for us to learn from the advanced technology and equipment of foreign countries[8]. The development and application of energy-saving technology is the basis of air conditioning system. The most advanced technology must be adopted for energy saving of air conditioning. FM technology needs to be actively promoted. The system transmits warm and cold temperature to the room through air conditioning or air conditioning room. Different necessity of public place and residence will lead to excess energy consumption of public buildings. By using frequency modulation technology, energy consumption can be reduced to less than 60%, which is necessary for public places. The system using renewable energy has some problems, but there are limitations on local use. At the same time, we should not blindly adopt new energy-saving technologies. They have to do it according to the conditions. In this process, we need to sum up experience and actively promote the continuous improvement and innovation of this technology. In order to reduce the cost, we should not only optimize the air-conditioning equipment, but also consider the allowable range of power to minimize the power load and achieve the goal. Electricity demand needs to include price and load. At present, there are three kinds of electricity prices. Backup cooling can be

combined with energy-saving optimization module to adjust the HVAC load, so as to reduce the power load and achieve the optimization goal of energy saving and cost reduction of HVAC.

3.4. Actively Adopt Water Balance Device

The system is designed to reduce the resistance as much as possible to reduce the energy consumption of the medium. The oil pressure balancing device can better achieve the purpose of energy saving. It can be effectively installed in the air conditioning water system and heating system to play its role. There are several issues that you are aware of during a specific installation. In the constant flow system, it is necessary to design system and pipeline to achieve oil pressure balance. If the balance cannot be achieved due to flow and pipe diameter, the static balance valve must be commissioned to achieve the purpose[9]. The flow dynamic balance valve can be set in the variable flow system. The application of dynamic floating valve is usually under the condition of water surplus change. The hydrostatic balance valve can be set at the hot inlet to achieve hydraulic balance. The dynamic flow control balance valve can be used after adjusting the system and calculating the hydraulic power.

4. Conclusion

In the increasingly severe environment of our country, we should strengthen the research on energy saving and emission reduction of air conditioning system, take effective measures to reduce the energy consumption of HVAC system and save the user cost. This will contribute to the construction of ecological civilization.

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