

Original Paper

Discussion on Building Environment and Energy Saving of

HVAC

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Abstract

Against the backdrop of rapid socio-economic and scientific and technological development, HVAC has become an indispensable part of people's daily lives in China. However, there are serious energy consumption issues in the use of HVAC, which not only bring significant economic costs but also exacerbate the pressure on energy supply, which is not conducive to the stable development of China's social economy. The development of the construction industry needs to adapt to the needs of modern living environments, and the resource and energy consumption issues in the construction process are becoming increasingly prominent, profoundly affecting the sustainable development of society. In the social environment advocating green and environmental protection, people are pursuing a higher level of building environment. In building construction, energy-saving materials and equipment should be used more to contribute to the green mountains and waters. In order to improve the energy-saving level of HVAC, this article analyzes the impact of building environment on HVAC energy-saving and proposes some specific measures, hoping to provide effective reference for the development of HVAC energy-saving technology.

Keywords

Architectural environment, HVAC, conserve energy, reduce emissions, measures

1. Introduction

Since the reform of China's economic system, the construction industry has developed rapidly and gradually become a pillar industry for the sustained growth of China's overall economy. Among them, HVAC is particularly important in the overall building, as it is a relatively important component of the building and an important link in improving the overall quality of the building. However, it will increase energy consumption during use. With the increasing awareness of environmental protection in daily life, people are paying more attention to energy consumption during the use of HVAC. With the

widespread application of HVAC in the daily lives of Chinese people, the quality of life has significantly improved. However, the widespread application of HVAC has caused significant energy supply pressure, and there is a serious problem of energy waste during the use of HVAC, which has had a certain impact on the stable development of China's social economy. Through in-depth analysis of building environment and HVAC energy efficiency, it is beneficial to find more reliable measures to improve the level of HVAC energy efficiency and lay a solid foundation for China's social development.

2. The Impact of Building Environment on HVAC Energy Efficiency

2.1 The Impact of Indoor Environment on HVAC

With the increasingly deteriorating environment in our country, people are increasingly emphasizing the energy-saving effect of HVAC through ecological buildings. HVAC regulates people's living environment and improves their quality of life through refrigeration and heating systems. The implementation of air conditioning functions requires a certain amount of energy consumption, so reasonable handling of the relationship between building processes and HVAC is an important means to reduce energy consumption and optimize the environment. Firstly, in the process of architectural design, it is necessary to reasonably design the building shape coefficient and window to wall ratio to improve the energy-saving performance of the building itself. Building energy-saving measures such as facade orientation and plane design can effectively reduce energy consumption and control the load of HVAC. Secondly, in order to reduce the load of HVAC, it is necessary to pay attention to the design of building orientation and shape, in order to achieve energy conservation in HVAC. When conducting architectural modeling and graphic design, it is necessary to use various methods such as north-south transparency, glass curtain walls, etc. to improve the energy-saving effect of the building and reduce the load of HVAC. Finally, building a comfortable living environment for residents and regulating indoor gas flow rate, humidity, temperature, and thermal radiation are the main functions of HVAC. By leveraging the thermal performance of building envelopes, the impact of outdoor temperature changes on the indoor environment can be reduced, thereby controlling the utilization rate of HVAC.

2.2 The Impact of Indoor Environment on HVAC

To achieve effective control of HVAC load, it is necessary to fully understand the impact of outdoor environment on HVAC, which is mainly reflected in the following aspects:

(1) The impact of meteorological conditions on HVAC. At present, HVAC includes several systems such as ventilation, heating, and air conditioning, which have different requirements for outdoor parameters and require accurate calculation of system loads to provide a favorable basis for achieving energy-saving HVAC.

(2) The impact of environmental greening on HVAC. In the construction process of construction projects, it is common to plant some flowers, plants, and trees, which can not only provide good environmental beautification, but also have certain radiation and heat absorption effects. If the

environmental greening meets the requirements, the heat absorption and insulation functions of plants can be fully utilized to reduce the load of HVAC.

3. Specific Measures for Energy Saving in HVAC

3.1 Reduce the Load of the Air Conditioning Fresh Air System

Fresh air volume is an important aspect of HVAC health standards. Generally, the energy consumption of fresh air systems accounts for about 30% of the total energy consumption of the system. As the fresh air volume continues to rise, the energy consumption of the air conditioning system also increases. Therefore, on the basis of meeting the health standards of HVAC, it is necessary to effectively control the fresh air volume of the air conditioning fresh air system, in order to reduce the energy consumption of the air conditioning system. At the same time, in the control and management process of the air conditioning fresh air system, it is necessary to consider the changes in different seasons, such as fully utilizing the cooling capacity of outdoor fresh air during the transition season, in order to reduce the demand for artificial cooling sources and effectively reduce the energy consumption of the building air conditioning system.

3.2 Adopting Air Conditioning System Heat Recovery Technology

Based on the operation of previous HVAC systems in buildings, there is a serious problem of waste heat throughout the entire process. Effective utilization of these waste heat can effectively improve resource utilization and enhance the energy-saving effect of HVAC systems. When most of the heat is sent back to the hot air state or cooled by the return air, it will inevitably cause significant energy consumption, and other return air will also be discharged outdoors, resulting in the waste of heat or cooling carried by the return air. So, in order to improve energy utilization efficiency, it is necessary to use energy recovery devices to recover and utilize these thermal energy, and treat the air through exhaust waste heat, so that the state of the discharged gas can be consistent with the state of the outdoor gas, thereby reducing the energy required for fresh air and reducing the impact on the outdoor environment.

3.3 Fully Utilize Renewable Energy

In order to alleviate energy supply pressure and protect the ecological environment, it is necessary to fully utilize renewable energy to effectively improve the energy-saving and environmental protection performance of building HVAC systems. The use of renewable energy in building HVAC can not only reduce energy consumption but also reduce environmental pollution caused by HVAC, enabling HVAC to meet the requirements of sustainable development in China's society. At present, when applying renewable energy to building HVAC systems, there is a significant demand for capital costs. How to reduce the investment cost of system construction is an important issue in the application of renewable energy technology in HVAC systems. Relevant practitioners should strengthen research on renewable energy technology, integrate it with HVAC technology, and optimize and improve the functionality and performance of HVAC equipment, fully meet the needs of the Chinese people for the use of HVAC.

3.4 Reasonable Design of HVAC Systems

Firstly, it is necessary to fully utilize frequency conversion technology to improve equipment efficiency and reduce system energy consumption. At the same time, it is necessary to adjust the air flow and water flow according to the load of HVAC, in order to reduce the energy consumption of fans and pumps and reduce the energy loss during the system operation and regulation process. Secondly, it is necessary to reasonably select cold and heat sources, taking into account the local environment, meteorology, energy supply, and system reliability, in order to minimize the energy consumption of the system as much as possible. Finally, it is necessary to improve the automation control level of HVAC systems, so that they can adjust the operating mode and parameters of HVAC according to the actual situation inside the building, in order to reduce unnecessary energy consumption and effectively improve the energy-saving effect of HVAC.

4. Conclusion

In summary, in order to improve the energy-saving effect of building HVAC, it is necessary to fully consider the impact of the building environment on HVAC. It is also necessary to reduce the load of the air conditioning fresh air system as much as possible, adopt air conditioning system heat recovery technology, and design the HVAC system reasonably. This will improve the energy-saving level of building HVAC systems from multiple aspects, laying a solid foundation for the sustainable development of the construction industry and society. Science and technology are constantly developing and advancing, and the application of technology is increasing in various industries. The emergence of many new materials has provided new impetus for the building environment. For the problem of high energy consumption, relevant enterprises should first pay more attention to design issues, and then deepen the concept of energy conservation in their hearts. Under the premise of playing a good role in HVAC, the goal of air conditioning energy conservation is achieved, thereby saving resources.

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