

*Original Paper*

# Research on the Development of HVAC Technology and Building Energy Conservation in China

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## **Abstract**

*Under the influence of the concept of energy conservation and environmental protection, more and more people begin to pay attention to the energy-saving design of HVAC. In building structure, central air conditioning is an important system to adjust indoor temperature and humidity. Because the system will consume a lot of energy in the actual operation process, the design of central air conditioning system has also become an important link affecting energy consumption. At present, China has also put forward the strategy of carbon neutrality and environmental protection, which also puts forward new requirements for HVAC system design. In order to achieve this goal, this paper analyzes the development of HVAC technology and building energy saving in depth, hoping to provide effective reference for relevant personnel.*

## **Keywords**

*HVAC technology, Development, building energy conservation*

## **1. Introduction**

With the rapid development of China's social economy, the living standards of our people have been significantly improved, and higher requirements have been put forward for building energy efficiency while meeting the use functions of buildings. At present, building energy consumption includes natural gas, water resource consumption, ventilation energy consumption, heating energy consumption and household appliances, etc. Among them, air conditioning and heating account for more than 60% of the total building energy consumption, which brings great pressure to China's energy supply. Air conditioning has gradually entered every household, and people also put forward stricter requirements for the quality of housing. Traditional HVAC technology can't meet the needs of energy-saving buildings. Under the condition of green buildings, HVAC needs innovative technologies, and new technologies and new energy-saving and environmental-friendly materials can meet today's

energy-saving needs. This paper will analyze the problems existing in the development of HVAC technology and give corresponding solutions and suggestions.

## **2. Overview of HVAC Technology Development**

Air conditioning has gradually entered every household, and people also put forward stricter requirements for the quality of housing. Traditional HVAC technology can't meet the needs of energy-saving buildings. Under the condition of green buildings, HVAC needs innovative technologies, and new technologies and new energy-saving and environmental-friendly materials can meet today's energy-saving needs. According to the development status of HVAC technology, this technology mainly includes the following aspects: (1) refrigeration technology. This part mainly includes new refrigeration cycle, natural refrigerants, refrigerants containing chlorofluorocarbons and so on. (2) Heating technology. Low-temperature floor radiant heating, application of new heaters, transformation of heating system, implementation of household heat metering, combined cooling and heating technology, regional heat supply and cold supply technology. (3) Ventilation technology. Winter and summer residential ventilation, public place ventilation, hospital air conditioning clean ventilation, hospital blast control ventilation technology and so on. (4) Energy storage technology. Heat storage heating, water storage technology, water storage air conditioning and low temperature air supply technology, etc. Secondly, in the development of HVAC technology, it is easily influenced by the role of envelope and planning and design. As far as the role of envelope is concerned, it can be divided into internal envelope and external envelope, in which the internal envelope includes indoor subway, indoor partition wall, ceiling and so on, while the external envelope includes windows, roofs and external walls and so on. At present, there is a large heat transfer loss in the building envelope, which requires effective improvement measures to improve the thermal performance of the building envelope; As far as the function of planning and design is concerned, reasonable planning and design can guide the energy-saving design of buildings. The whole process should fully consider the building trend, solar radiation, dominant wind direction, functional zoning, road layout, building site selection and other aspects. By optimizing the climate environment of buildings, the advantages of solar energy, dominant wind and topography can be fully exerted, so as to achieve good energy-saving buildings.

## **3. Specific Suggestions on Building Energy Saving through HVAC Technology**

### *3.1 Reasonable Design of HVAC System*

Reasonable design of HVAC system can effectively improve the level of building energy saving, meet the needs of users and reduce energy consumption. In the design process of HVAC system, the design is generally based on the maximum allowable load. However, in the actual operation process of HVAC system, it is difficult to reach the state of full load operation, and the whole process still produces energy consumption at full load, which eventually leads to a great energy waste. In order to improve the rationality of HVAC system design, it is necessary to optimize the air supply volume in

combination with the local climate environment, reduce the system running time as much as possible, and effectively reduce the energy consumption of HVAC system.

### *3.2 Optimization of HVAC Maintenance Technology*

In order to ensure the stable operation of HVAC system and reduce the cost waste caused by inadequate maintenance, it is necessary to optimize the maintenance technology of HVAC system to make HVAC system in a safer and more stable operating environment. At the same time, with the rapid development of the construction industry, China has put forward clear requirements for the design of HVAC system maintenance scheme, which requires regular maintenance of HVAC system to maximize the maintenance level of HVAC system. When optimizing the HVAC maintenance technology, it is necessary to do a good job in equipment maintenance and overhaul to ensure the stable operation of the equipment system, and also to strengthen the technical training of the staff, and constantly improve the ability and quality of the maintenance personnel, so that they can better complete their tasks and improve the scientific and effective maintenance of HVAC systems.

### *3.3 Strengthen the Control of HVAC System*

During the operation of HVAC system, the indoor wind speed, temperature and humidity are controlled to build a comfortable living environment for residents. According to the control and management of HVAC system in the past, sensors are generally used to detect the humidity and temperature in the building room, and then the humidity and temperature in the building room are adjusted according to the data information, so that the indoor environment can be effectively improved. Although this kind of HVAC control method has a certain effect, it is easy to have various control problems, so it is necessary to develop a set of multi-factor control mechanism to better control the HVAC system and give full play to its functional utility.

### *3.4 Reduce Energy Consumption of Heat Medium*

During the operation of HVAC system, it is necessary to strictly control the energy consumption of each link, and build an integrated HVAC energy-saving system based on the system design and operation. As an important part of HVAC system, the heat medium transmission system directly affects the energy-saving effect of buildings, so it is necessary to choose directly buried pipes with thermal insulation performance to prefabricate hot water and reduce the energy consumption in the process of thermal energy transmission. At the same time, it is necessary to make full use of computer technology to test the heating situation of the system, and optimize the pipe network flow through intelligent pipe network and balance valve. In addition, the power transmission system can be applied to the energy-saving design of HVAC, so as to optimize the power system design, apply the supply pipeline with large temperature difference, good load property and high operation efficiency to the power system, and reasonably select the power equipment, so as to effectively improve the heat energy transmission efficiency.

#### 4. Conclusion

To sum up, in order to promote the development of HVAC technology and improve the level of building energy saving, it is necessary to strengthen the research on HVAC technology, realize building energy saving through HVAC technology and build a better living environment for our people. Air conditioning has gradually entered every household, and people also put forward stricter requirements for the quality of housing. Traditional HVAC technology can't meet the demand of energy-saving buildings. Under the condition of green buildings, HVAC needs innovative technology, adopting new technologies and new energy-saving and environmental-friendly materials to meet today's energy-saving needs. In order to play the positive role of HVAC technology in building energy-saving design, it is necessary to rationally design HVAC systems, optimize HVAC maintenance technology, strengthen the control of HVAC systems, reduce the energy consumption of heat media, and improve the energy-saving effect of HVAC systems through various measures, laying a good foundation for the sustainable development of our society.

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