Research on Air Conditioning Electrical Energy Saving Control Based on Computer Neural Network

Mingjun Li¹, Qing Wu¹, Deming Chen¹
¹Heilongjiang Institute of Construction Technology, Heilongjiang, China

*Corresponding author e-mail: limingjun@hict.org.cn

Abstract. Air conditioning has become an indispensable electrical equipment in people's life. However, there are still a considerable number of air conditioning electrical equipment control is still mainly based on conventional control, these control methods have great limitations, which makes its energy saving effect is greatly affected. Based on this, this paper first analyses the energy-saving principle of air-conditioning system, then studies the energy-saving control of air-conditioning system based on neural network, and finally gives the evaluation strategy of air-conditioning electrical energy-saving based on nerve network.

Keywords: Air Conditioning, Energy Saving Control, CNN

1. Introduction
With the continuous improvement of people's living standards, people's requirements for the comfort of life and work are also constantly improving. In this context, air conditioning has gradually become indispensable electrical equipment in people's life. But the energy consumption of air conditioning equipment is high, which makes the energy consumption of air conditioning equipment increase. With the iterative progress of modern tech represented by computer nerve network, its application in the field of air-conditioning electrical energy-saving control greatly improves the level of air-conditioning energy consumption control [1]. At present, the contradiction between energy demand and supply has become increasingly prominent. To carry out energy-saving control of electrical equipment represented by air-conditioning, reduce its energy consumption and improve the user's experience and feelings, has become the research focus in the field of electrical energy-saving control.

Energy conservation and rational use of energy have important promotion value for improving the building energy consumption environment, but the current research and application of electrical energy-saving control is still focused on a more macro level, and lack of targeted research on electrical control and other details. Air conditioning electrical energy-saving control mainly includes the design of electrical system energy-saving, such as educational equipment load characteristics for distribution design, so as to reduce the loss of electrical lines as much as possible. In addition, air conditioning electrical energy-saving control also includes the use of intelligent control system to achieve energy-saving operation, such as full application of nerve network, AI and automatic control and other aspects of the results, its application to the energy-saving control of air-conditioning equipment can effectively achieve energy-saving equipment.
In addition, the operating environment of air conditioning electrical equipment will also have a significant impact on its energy consumption, so the optimization of the use environment of electrical equipment can also reduce the energy consumption of electrical equipment. At present, the control of air conditioning and other electrical equipment is still mainly based on conventional control. These control methods have great limitations, which makes its energy-saving effect be greatly affected. On the other hand, some air conditioning systems still need more manual intervention and management, so as to achieve maximum energy saving [2]. It can be seen that there are still many deficiencies in the current air conditioning electrical energy-saving control, which needs further improvement.

In short, with the continuous enrichment of the functions of air conditioning electrical equipment, the composition of its air conditioning system is becoming more and more complex, and the energy consumption level of various components is also different. Therefore, it is necessary to use the intelligent control tech represented by nerve network to realize the automation and intelligent energy consumption control of different parts. The application of nerve network to the air conditioning system can improve the control algorithm of the existing air conditioning system, realize accurate and independent electrical energy saving, and help to reduce the total energy consumption of the system. Therefore, the research of air conditioning electrical energy saving control based on computer nerve network has important engineering practice value and social environmental protection value.

2. Energy saving principle of air conditioning system

2.1. Composition of air conditioning system
With the gradual complexity of modern air conditioning function, its structure is also more and more complex, the various parts of the air conditioning system cooperate with each other to achieve its effective control of temperature. Air conditioning establishes a reasonable system operation system by changing the surrounding environment, and there is a strong cooperation between the various parts of the air conditioning. Only through reasonable control to achieve the overall management and control, and based on the load change, carry out intelligent control mechanism, can effectively realize the energy saving of the system. Each component of modern air conditioning has a relatively independent circulation circuit, which can ensure the stability of the system operation. Therefore, the energy-saving research of air conditioning system also needs a structural analysis from the overall level to the component level.

2.2. Energy saving principle of air conditioning system
Because the air conditioning system will be disturbed and operated by the external environment in the process of operation, its load will also vary with the external environment, and the conventional energy-saving measures are difficult to achieve the goal of energy saving [3]. Only through intelligent electrical energy-saving control, can the energy consumption of air conditioning be fully saved. Different control methods for different parts of air conditioning can achieve effective energy saving. For example, applying different control strategies in different parts can improve the stable operation state of the system and realize the electrical energy saving of air conditioning.

In addition, energy saving of air conditioning system includes chiller energy saving, chilled water system energy saving, cooling water system energy saving, cooling tower energy saving, air conditioning unit energy saving, fan coil energy saving and overall system energy saving, as shown in Table 1 below. Among them, in the chilled water system energy-saving level, including the primary pump frequency conversion speed control system according to the change of environmental disturbance, automatically adapt to adjust the frequency converter; secondary pump frequency control system through changing the frequency of the water pump, so that it can control the change of water inflow, can reasonably operate the system to achieve the purpose of electrical energy saving.
**Table 1.** Composition of energy saving air conditioning system.

| Composition                | Principles                                                                 |
|----------------------------|----------------------------------------------------------------------------|
| Water chilling unit        | Energy saving can be realized by controlling the time and quantity of the discharge |
| Chilled water system       | Adjust the compressor unit adaptively to reduce the load and adjust the temperature |
| Cooling tower              | Keep the frequency of all fans consistent                                   |
| Air conditioning unit      | Change the control of fresh air volume                                      |
| Fan coil unit              | Adjust the temperature to a reasonable range                                 |
| Overall system             | Dynamic adjustment of control part parameters                               |

2.3. Energy saving methods of air conditioning system

Air conditioning system through the control of chilled water inlet temperature value to achieve accurate control of temperature, and can effectively achieve energy saving [4]. Based on the disturbance change of air conditioning unit environment, the control method is analyzed reasonably. Secondly, according to the difference of air conditioning host and its temperature change, the accurate matching of actual situation is realized. In addition, it can ensure the stability of the whole system by analyzing the operation of the system. Based on the different external environment, the rationality of the error is analyzed, so that the overall air conditioning system can achieve good energy-saving effect.

3. Energy saving control of air conditioning system based on nerve network

3.1. Nerve network control of air conditioning system

The components of complex air conditioning system, especially central air conditioning system, are more complex, and the structure and function of each component are quite different. In order to achieve accurate control and temperature regulation, it is necessary to carry out accurate control through intelligent module [5]. Secondly, the control module should be able to determine the state variables based on the state of the air conditioning unit, so as to change the parameters of the air conditioning system, so as to create a more comfortable temperature environment space. The application of nerve network system in air conditioning electrical energy-saving control can simplify the complex control logic and structure of the whole system, and help to effectively match and adjust various parameters, so as to realize the effective connection between variables.

In addition, in the air conditioning system control process level, through the effective setting of air conditioning system parameters, set the operating parameters of each system, so as to achieve accurate control and regulation. In order to further strengthen the data processing of the air conditioning system and the recovery ability under the effect of external environment, it is necessary to optimize the architecture level, so that the air conditioning system can operate quickly and stably in multiple environments and achieve stable control. In the structure level of the adaptive predictive controller, it is necessary to further optimize the control structure to make the system structure more complete, and according to the changes of environmental parameters, the system can achieve stability in time. The structure of air conditioner controller is shown in Figure 1.

![Figure 1. The structure of air conditioner controller.](image-url)
3.2. Fuzzy nerve network predictive control of air conditioning system

With the continuous improvement of people's requirements for air conditioning comfort, not only the air conditioning temperature is put forward higher requirements, but also the control accuracy of its air volume needs to be further improved, so as to better improve the user's sensory experience and comfort [6]. In this context, VAV air conditioning gradually launched the market, it can be adjusted according to the changes of the environment. The control system of VAV air conditioning is mainly composed of generating device, heat circulation device, carrier conveying device and conversion device. Through effective cooperation with each part, it can ensure the dynamic and temperature operation of the whole system, and make the environment more adjustable and comfortable.

The operation process of VAV air conditioning system based on computer nerve network is shown in Figure 2 below. Through the detection of samples, intelligent analysis is carried out, and then the adjustment and supplement of parameters are carried out. Then according to the signal output of the sensor, the input operation of the inverter is carried out, so as to guide the frequency converter to effectively adjust the operation of each part of the air conditioner. The introduction of nerve network control in the whole process can avoid the nonlinear changes caused by unknown factors, so as to achieve the purpose of energy saving.

![Figure 2. Operation flow of VAV air conditioning system based on nerve network.](image)

4. Evaluation of air conditioning electrical energy saving based on nerve network

4.1. Principles of evaluation index system of air conditioning electrical energy saving

The establishment of evaluation index system of air conditioning electrical energy saving based on computer nerve network should be based on the principles of scientific, stability, feasibility, unity of comprehensiveness and emphasis, unity of difference and variability, and unity of accuracy and fuzziness. The evaluation index system of air conditioning energy saving based on these principles can effectively judge whether the air conditioning system meets the energy-saving specifications and standards, so as to improve the air-conditioning electrical energy-saving design and management. In addition, based on the evaluation index system, the standardization and standardization development of air conditioning electrical energy-saving work can be realized.

4.2. Construction of air conditioning electrical energy saving evaluation index system

In order to make the whole index system more scientific and reasonable, it is necessary to consider comprehensively the energy consumption and environmental impact of air conditioning system in the whole life cycle, as well as the increase of cost and resource consumption and environmental impact caused by energy-saving control. It can be seen that the construction of air conditioning electrical energy saving evaluation system is a more complex system engineering. In addition, in the process of building the evaluation index system of electrical energy conservation of air conditioning, we need to select scientific and reasonable evaluation parameters to better adapt to the evaluation of building electrical energy-saving related indicators. The construction of air conditioning electrical energy-saving evaluation model based on nerve network needs to go through the process of model training and algorithm implementation, and finally realize the evaluation of air-conditioning system electrical energy-saving with legal weight of analytic hierarchy process.
5. Conclusion
In summary, air conditioning electrical energy-saving control uses the intelligent control represented by nerve network to realize the energy-saving operation of the system. The application of nerve network control to the energy-saving control of air-conditioning equipment can effectively realize the energy-saving of the equipment. In this paper, through the study of the energy-saving principle of the air-conditioning system, the composition of the air-conditioning system, energy-saving principles and methods are analyzed. Through the analysis of energy saving control of air conditioning system based on nerve network, the nerve network control of air conditioning system is studied. Through the analysis of air conditioning electrical energy saving evaluation based on nerve network, the construction of air conditioning electrical energy saving evaluation index system is studied.

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