Research on energy saving application of small high-rise office building in BIM model

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Abstract: In recent years, both urban and rural buildings and newly built buildings are mostly high energy consumption. According to big data statistics, the area of construction completed in one year in our country is far more than that of all the relatively developed countries in one year. Global warming, the role of air conditioning has attracted people's attention, for the hot summer, the problem of excessive electricity is becoming more serious. However, for the cold winter, the heating consumption of urban buildings becomes the most important part of high energy consumption of buildings in China. On the current situation, the building energy-saving publicity is far from reaching the need for rapid development. The general buildings follow the original ecological construction plan and technical means, and the construction works are not re-calculated and designed. We need to judge its energy-saving design, economic design and green design. Old-fashioned 2D software relies solely on the manual input of professionals to deliver relevant building data to professional software systems for analysis and utilization. Professional data are plentiful and input-intensive, so architects are more eager for efficient energy analysis and building simulations, and then building solutions. With the information technology of high-end industry constantly intelligentized, BIM technology as the main information, 3D types and other construction software level tends to be perfect. In order to design more green buildings and optimize the energy analysis structure, the high energy consumption of building solar energy and air conditioning system based on BIM is analyzed and studied with the model of an office building in Hunan area.

1. Introduction

As the global warming becomes more and more serious, the excessive consumption of energy by human beings causes the global energy shortage, which has a great impact on the economic development strategy of our country. During the same period, the proportion of energy consumed in the total energy consumption of all kinds of buildings has been continuously strengthened, and energy-saving measures have been adopted as far as possible to ensure that the state formulates energy plans. There are also significant differences in energy consumption in the design of different types of buildings, so we have to conduct relevant energy consumption simulation tests to verify compliance with the energy saving specifications when considering the construction scheme. On the contrary, the traditional sense of energy consumption software test building energy saving recognition degree is low. On the one hand, the traditional concept of energy consumption testing software not only needs huge professional data, the operation process is cumbersome, high level of specialization. Architects can not rely on their own strength to study how to optimize the energy consumption software and the subsequent summary work. On the other hand, in the so-called traditional design scheme, the knowledge of architecture and equipment is irrelevant. The main task of the equipment engineer is to input the building information data manually, and then process the information through the software of energy consumption analysis, but the final result is only reflected in the building model indirectly, so the energy consumption analysis will finally be established after the design stage, so that the design reference basis can not be provided to the architect immediately.

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With the continuous digitization of information technology, BIM technology as the main source , 3D and other types of building software application level tends to mature. All kinds of talents begin to carry out research and design on BIM in the software of building energy saving, and promote the building to be gradually automated and efficient in the aspect of energy saving design, which is more reliable and accurate in the final design link of energy saving.

2. Energy-Saving Targets for Construction Projects

The influencing factors of building energy consumption are: building direction, building area, building structure performance and natural ventilation, coefficient of building body and so on. For BIM technology, the building energy saving test relies on the information model obtained by the architect to determine the direction of the building, the appropriate component size, material classification, functional division and other relevant information, and to use the analysis to meet the standard energy saving specifications. As far as possible to make the annual energy consumption to meet the requirements of the specified line specifications, if the energy-saving specifications, the content of the building model changes summary complete feedback to the architect, then the architect will need to give feedback on the proposed model changes. This cycle is repeated until the building meets the standards for energy conservation. Based on BIM technology, building energy saving not only solves the problem of architectural design, but also can perfect the conversion of data information in the design process, and the working level is improved. Therefore, it provides the basis for the optimization and upgrading of solar buildings and the research and analysis of air conditioning system, and then promotes the planning of building energy saving to become more scientific and meet the needs of realistic development[1].

Figure 1 Construction

3. Application Development of BIM Technology

3.1. Background of Energy Conservation Application Projects

Taking a 12-story traditional office building in Hunan area as an example, the total area is about 10,000 square meters, the height is about 40 meters, and the structure mode of reinforced concrete is the main one. Through the BIM model of this kind of office building, it is transformed into the software of green energy saving building analysis to test, to explore the solar energy utilization of the office building and the upgrading of the air conditioning internal system.

3.2. BIM Model

According to the architectural graphic design of this office building, the information modeling project of BIM is established. In order to better analyze the research and development of energy-saving design and green design, it is necessary for the new BIM model to satisfy all the true and

effective information of the building, including the appearance information of geometric description, material, size, size and so on, and other huge non-geometric information: the utility of the material, the performance of the heat transfer, the cost and the information of purchasing.[2].

3.3. Transformation of Models

Based on the application software of the bim model, ecotect plays a great supporting role as a sustainable tool for architectural design analysis. All the surrounding natural environment can be simulated, and the relatively simple block objects can be selected to predict the diversity, diversity and performance of the building body before the most critical scheme design link has fully grasped the data, and the various types of building bodies can be compared and analyzed in order to better provide the basis for feedback to the architect. Revit application software is dedicated to building information models to help designers build and maintain more efficient buildings. Before the built SIM model can be successfully imported into Ecotect, the derived three-dimensional view should be shut down in order to minimize the loss of other application objects, and then rely on the profile box to test specific elements.

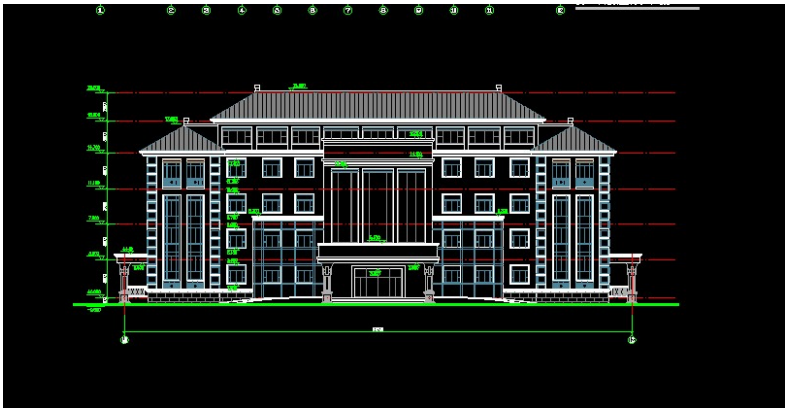

Figure 2 BIM model

4. Ecotect Energy Saving Design

4.1. Main Design Contents of Buildings

According to the design specifications of the current building energy saving, it is necessary to strictly control the building design link and the maintenance structure link. The design of the prescribed index needs to meet the energy saving specification for the building shape, direction, heat transfer shading coefficient and illumination, the advantage of which is to save the consumption of time and energy, which is beneficial to the calculation and analysis. performance of the design requirements, allowing part of the coefficient index to exceed the specified limit, only to ensure that the comprehensive index of the energy saving link in the design scheme is lower than the standard specification. Passive solar energy as a building body in the energy-saving embodied incisively and vividly, the building's internal structure, material collection, solar energy distribution play a vital role, in order to create a warm and bright image of the building body, passive solar energy and ordinary buildings do not have an absolute boundary, only for the cost savings of solar energy, economic benefits have a high and low difference[3].

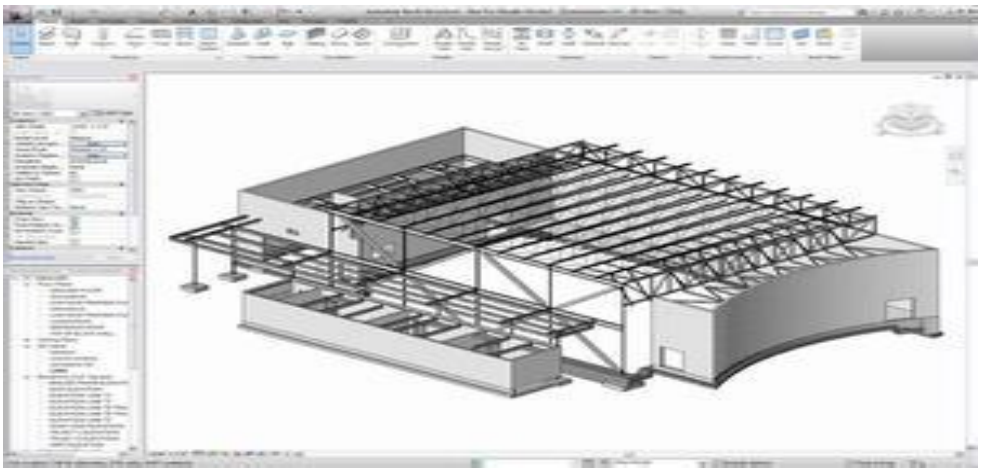

Figure 3 Architectural design presentation

4.2. Testing of Solar Radiation

According to the understanding of geographical environment, the region stores less solar radiation during the overheating period throughout the year, while more solar radiation is stored during the undercooling period. We should balance the planning and design of the building to achieve comfortable energy-saving effect. On the other hand, the humidity, temperature, speed data of the climate are analyzed to find a relatively comfortable area to provide a guarantee for passive design of the building strategy. The passive design of solar energy can be used for heating through solar energy when it is in cold air in a certain area. Set up the number of people, window wall height and heating situation, according to the climate big data simulation analysis. In general, we need to base passive design on window wall height and heating[4].

4.3. Testing of Air Conditioning Systems

The data show that in the process of exploring the energy saving of buildings in China, the energy consumption of air conditioning accounts for a large part, so it is necessary to study and analyze it. When setting up the model, we should divide the space heat area, set the parameters, and complete the successful import of the BIM model. In setting the material, it is necessary to set the thermal coefficient in accordance with the actual situation to ensure the accuracy. When setting the thermal environment, the indoor thermal environment should reach the specified setting parameters. In the heating mode, ventilation for good consideration, in order to get accurate simulation results. In setting the properties of the area, pay special attention to the type of system, the time of operation, and the need to distinguish between different places in the same building.

5. Conclusion

Through the BBIM model of the building construction of the typical office building, and then input the established model into the energy saving test software, the energy consumption and radiation degree of the building are analyzed, and the energy saving of the building is analyzed on the basis of BIM, and the energy saving consumption of the building is related to the direction of the building, the radiation coefficient, the machinery and equipment, etc. The changes of these factors play an important role in the energy saving of the building. The introduction of BIM solves the great obstacle for the design of building energy saving in our country, but in the energy saving link of green building model, some data information will be lost and omitted, which can not achieve the green effect of building cycle in the real sense. Some domestic building code information has not entered the model of BIM, although BIM does not play its ability, even if there are some problems in energy-saving buildings based on BIM technology, but the technology of BIM and green building will be the future development trend, only to combine the two organically to better apply to the practice process for the architect.

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