Application of elbow inlet Revit modeling in BIM technology research of pumping station

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Abstract: With the development of computer technology and BIM technology in water conservancy engineering construction promotion and application. Many previously intractable problems have been solved by the introduction of new technology. BIM technology not only has a powerful information processing capability, but also provides the conditions for solving the problem of building refinement in the construction process. Revit software was used for modeling and parametric management in the project of Paihekou, which solved the problems of accurate calculation, three-dimensional view and fine template making

1 Introduction

Pump station engineering is an important part of hydraulic construction, because of its important role and complex construction technology, has been the majority of scholars and practitioners pay attention to. The main structure of the pump station project can be roughly divided into the base part, the bottom layer, the inlet runner layer, the water pump layer, the maintenance layer, the shaft layer and the motor layer, and the workshop, etc. The role of inlet passage is to guide water flow into the impeller chamber of the pump in an orderly and uniform way from the front pool, which plays a transitional role and provides an appropriate flow pattern for the inlet of the impeller chamber to ensure the stable and efficient operation of the pump. According to the shape of the structure, the inlet channel mainly includes elbow inlet channel, s-shaped inlet channel and bell-shaped inlet channel. The overall structure of the elbow-shaped channel is the most complex, which presents as a three-dimensional curved structure in space. Due to its complex structural characteristics, as well as objective reasons such as the level of map recognition by the construction personnel, it is impossible to guarantee the accuracy of construction for the construction personnel to control the construction only through the flow channel single line drawing and section drawing. In particular, in the process of template lofting, different lofting divisions in some local sections will have a slight difference. Moreover, due to the complexity of the structure and the uncertainty of the construction, the accuracy of the measurement is difficult to be guaranteed.

The Paihekou pumping station hub is located in the Paihekou, the starting point of the communication section of the river and Huaihe river diversion line. It is a cascade pumping station hub connecting the river

diversion channel of the river diversion section between the river diversion line and the river diversion section of the river diversion section.

The main functions of the Paihekou pumping station hub are as follows: the incoming water from the diversion canal of Paihekou pumping station is directly pumped to Paihekou river through the pumping station and transferred to the north; Build a II lock, can ensure that level of 2000 t ship in Chaohu lake and river, and even run between Huaihe river; Control sluice control shall be built at the mouth of the river.

Revit software was used for modeling and parametric management in the project of pai hekou, which solved the problems of accurate calculation, three-dimensional view and fine template making.

2 Introduction to Revit functions

Revit software produced by Autodesk is one of the most widely used BIM software in the current construction industry. The software can not only help designers to design buildings more intuitively, but also achieve results that other software cannot achieve in terms of construction and calculation due to its excellent 3d modeling ability and powerful parameter informatization. Moreover, due to the excellent software ecological chain of Autodesk, Revit can cooperate with CAD, 3dsmax, even Lumion and other software to help and manage the whole process of the project effectively. Using Revit software function of comprehensive and innovative conceptual design is easy to use tool, the engineers can quickly to the structure of the parameterized model of the construction of parametric family is the basis of the construction design of Revit, due to the openness of the geometry system, users can accurately adjust to satisfy the requirement of the building and construction in terms of, also can better simulate the real performance so that

all parties understand the cost of the project, the construction period and the environment, etc.

3 Practice of Revit modeling for elbow inlet runner

3.1 Project summary

The Paihekou pumping station hub is located in the Paihekou, the starting point of the communication section of the river and Huaihe river diversion line. It is a cascade pumping station hub connecting the river diversion channel of the river diversion section between the river diversion line and the river diversion section of the river diversion section.

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Pie mouth pumping station design flow rate of 295 m³ / s, according to the specification for design of pumping station (GB50265-2010), and don't for I, such as its engineering, for big type (1) pump station, main building level for level 1, level of channels on both sides of the embankments at the inlet and outlet of the pump station for level 1. The designed flood level is 11.46m once every 100 years, and the checked flood level is 11.96m once every 300 years. Paihekou pumping station is designed with a net head of 4.8m. The station is a dike pump station. The pump type is converted from the excellent hydraulic model tj04-zl-06 to the real machine pump, the pump model is 3150zlq-85, the supporting motor model is tl2800-44/4250, the single machine power is 2800kW, there are 9 sets of units (one standby), and the total installed capacity is 25200kW. The inlet and outlet of the pump station are arranged in a forward direction. The flow direction of the main pump room is 33m along with the water, and elbow channel is adopted.

3.2 Apply Revit modeling

The modeling process is mainly divided into the following steps:

2 d drawing identification and import: in CAD, extract, modify and save the section of elbow inlet passage.

Establish a volume baseline in Revit, as shown in figure 1.

Import CAD drawings into Revit for reference. In addition, the section family was established in Revit (as shown in figure 2), and the parameters of the section family were modified according to the base figure to form an accurate section family. Put the section family into the volume model (figure 3), connect it as a whole according to the shape of the section family, ensure the

accuracy of the model according to the number of sections, and finally generate the model (figure 4).

Through the list of models, the volume, area and other important parameters of the model can be obtained to prepare for the follow-up work, as shown in figure 5.

3.3 Revit model parameters application

From the attribute list and list of the model, we can know the specific parameters of the elbow-shaped inlet channel entity: total volume, total surface area, length, width and height. Then the volume of the total volume minus the volume of the passage can be used to calculate the actual concrete consumption of the elbow-shaped inlet passage. Finally, according to the specification and quota of the list of each province, the budget of the elbow-shaped inlet passage can be calculated in the cost software.

Fig.1 Dimension baseline

Fig.2 Section of family

Fig 3 Volume model

Fig 4 The final model

4 Application of Revit modeling in BIM technology research

4.1 Information application

The 5D operation and maintenance platform of BIM technology can realize relevant optimization and reliability verification of the project before the actual implementation of the project. By adding time points into the model information, the construction sequence and construction organization can be simulated, so as to discover possible problems in the construction earlier, so as to realize pre-control, reduce risks, and provide convenience and speed up efficiency for the management and calculation in the later stage.

4.2 Collision check

Revit model includes all kinds of embedded pipelines and lines. Through the application of Navisworks software, collision between different structures and different professions can be checked. That is, collision checking with Navisworks software and modification with Revit software. This kind of simulation inspection before actual construction not only improves the efficiency, but also greatly saves the construction cost.

4.3 The quality control

Due to the accurate information model and visual 3d model of Revit software, it is convenient for the construction personnel to better understand the actual shape and size of each construction in the drawings, so as to better control the quality of each process in construction.

4.4 Realization of construction simulation guide runner construction

For the construction of large-scale construction, especially for large and complex components such as elbow inlet passage, Revit software can make section in any part of the model.

5 Conclusion

The application of BIM technology in the project of Paihekou pumping station not only saves the cost and time, but also provides valuable experience for the construction of outlet runner in other pumping stations. The most important thing is to prove that Revit modeling of elbow inlet passage is feasible and efficient. This BIM technology has played a positive role in the application and promotion of hydraulic construction.

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