Design of Cigarette Factory Based on Bim and System Integration under Industrial Monitoring

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Abstract. BIM, as a kind of building visualization modeling technology, is originally applied to the fields of engineering and construction. For cigarette factory design, BIM can realize efficient and convenient information assistance. BIM Technology combines all links and contents of engineering construction into a whole model by means of information technology, and can make changes according to the actual situation, which brings great convenience to the construction of cigarette factory and has very strong practicability. As an important information acquisition and feedback system of industrial system operation, industrial monitoring system can monitor industrial process through data, visualization and other technical means. It is of great significance to combine the two organically and explore the application of building model in the process of industrial monitoring for the design and operation of cigarette factory, as well as for the exploration of BIM’s full life cycle application.

1. Introduction
The engineering construction of cigarette factory involves many professional fields, therefore more advanced BIM Technology must be used in the integrated design. BIM Technology combines all links and contents of engineering construction into a whole model by means of information technology, and can make changes according to the actual situation, which brings great convenience to the construction of cigarette factory and has strong practicability. As an important information acquisition and feedback system of industrial system operation, industrial monitoring system can monitor industrial process by means of data, visualization and other technical means. The former can modeling the entire building and equipment in the design process of cigarette factory, judge the rationality of design and provide rectification suggestions through calculation, auxiliary and calculation technology. At the same time, in the future operation process of cigarette factory, BIM can be used as a building visualization model, cooperate with industrial monitoring system, and realize the real-time visualization of the whole factory state. This paper will combine the application of BIM in the design process of cigarette factory and the integration of industrial monitoring system to study the relevant scheme.

2. Application of Bim in Cigarette Factory Design
BIM (building information modeling) [1], refers to the “visual” digital building model based on the most advanced 3D digital design and engineering software. It provides designers, architects, plumbing laying engineers, developers and even end users with a scientific platform of “integration, simulation, analysis” to help them design, build and operate the project using three-dimensional digital model. Its ultimate purpose is to make the whole project in the design, construction and operation stages can effectively achieve the establishment of resource plan, control of capital risk, save energy, save costs, reduce pollution and improve efficiency. In order to realize the whole life cycle management of engineering
project in a real sense, the introduction of BIM Technology provides all kinds of basic data needed by engineering project, and ensures the response speed and accuracy of the decision-making of the leadership. At present, the technology has been widely used in various fields and links of architectural design, construction and later project operation and maintenance. BIM is the core technology of building lifecycle management (BLM). BIM has corresponding application value in the design, construction and operation management of cigarette factory.

As a building information model, it participates in the whole process of engineering design as a tool of 3D parametric design verification and 3D construction coordination in plant design, verification, construction monitoring, change management and other links. In the process of cigarette factory design, pipeline coordination is a key issue, and BIM can effectively complete the corresponding design work. As a time-consuming work of the project, the construction model change can also provide information support with the help of BIM.

2.1 Application of Bim in Pipeline Coordination Design

In the complex project design of cigarette factory, due to various systems and complex layout (as shown in Figure 1), the pipeline network facilities often collide with each other or between the pipeline and the structural components, causing trouble to the construction, affecting the indoor net height of the building, causing rework or waste, and even potential safety hazards.

Figure 1 Pipeline Model In the Cigarette Factory Bim

The traditional pipeline collision detection is deduced by human, usually one collision is removed, and many collisions are added at the same time. For complex engineering, it is limited to the low cost and low consumption of human resources to achieve effective collision detection. Through BIM, a three-dimensional model of building pipeline is built and collision detection is applied to realize the reasonable planning of pipeline. This process mainly checks and analyzes the direct cross hard collision between pipelines and other professional equipment, air ducts, beams, columns, foundations, steel structures and cable bridges. The soft collision (less than the space specified in the design specification) caused by the intersection of the pipeline and the adjacent pipeline insulation layer or the intersection with the reserved space for pipeline installation and maintenance, and the dynamic collision between the pipeline and the facilities and equipment on their working routes.

BIM imported all the pipeline models of cigarette factory into the same model, and marked the pipelines with collision problems by simulation technology and visualization. All parties of the project optimize the drawings according to the collision results. The detection effect is shown in Figure 2.
Through collision detection, BIM 3D pipeline comprehensive design can more intuitive, clear, efficient, full and accurate coordination of the pipeline layout of various disciplines.

2.2 *Bim Application in Construction Change*
Because of the complexity, long-term and dynamic of cigarette factory project implementation, it is impossible to foresee and cover all possible changes in the process of project implementation in the design stage. Therefore, for such large-scale construction projects, the design changes in the construction stage are inevitable. The time and factors of change may be out of control, but change management can reduce the increase of construction period and cost caused by change.

3. *Cigarette Factory Design Application of Industrial Monitoring System Based on Opc*
For the typical process industry of cigarette factory, computer integrated manufacturing system is widely used. From Figure 3, it can be seen that the computer integrated manufacturing system and integrated software are business oriented interfaces, and the process control network is the data collection basis of the operation status of the industrial system. At the same time, the computer network and distributed database are used to store the monitoring data, and the corresponding analysis software is used for health analysis.

The essence of industrial monitoring is the control system in process control network and its integrated monitoring application. The time factor of the control system is small. Generally, it monitors the operation of the production equipment in seconds or less, and grabs the operation of the whole industrial system in real time. The full name of OPC is OLE for process control, which is the application of OLE in process control. It is based on Microsoft's existing OLE technology, com (component object model) technology and DCOM (Distributed Component Object Model) technology, so as long as it has OPC interface or conforms to OPC standards, it can freely carry out device interconnection and interoperability. OPC defines a set of applications to support process data access, alarms, events, and process history data.

Access the COM interface of other functions. OPC adopts the communication mode of client / server, whose server function is to be responsible for the communication with the data provider (field equipment or database) on the one hand, and to provide the data provided by the data provider to the data caller through the standard OPC interface on the other hand. The data caller acts as the client of OPC. The standard interface ensures interoperability, enabling all OPC enabled customers to access all OPC servers in a consistent manner.

Based on the OPC application Ethernet in cigarette factory, the bottom layer data acquisition is completed by PLC control system, and then transmitted to the field operation station through OPC.
unified interface. Similarly, the communication between the field operation station and the monitoring PC is also completed through OPC interface. In this way, the monitoring PC and server can be both OPC client and OPC server. The industrial monitoring model based on OPC is shown in Figure 3.

Based on the OPC industrial monitoring system structure model shown in Figure 4, taking the tobacco factory’s silk production line as an example, the specific business monitoring scenario can be designed. The whole production line is divided into five process sections: blade treatment section, mixed treatment section, stem and stem treatment section, wind wire feeding section and Burley tobacco treatment section. Each section is set with a computer to monitor it, and a server and a programming and printing computer are set at the same time. The whole centralized monitoring system takes the central control room server as the center, and connects the CPU of each process section of the silk making line, the server of the central control room, the monitoring computer, the programming and management computer through Ethernet. Its main function is to complete the real-time monitoring of the operation status and fault status of the equipment in each process section through five monitoring computers set in each process section, and realize the start / stop, manual / automatic control, process parameter adjustment and other functions of each processing section. The industrial monitoring system network structure is shown in Figure 4. Other business line monitoring models are consistent with this idea.
4. Integrated Application of BIM and Industrial Monitoring System

For a long time, the construction industry with project operation as the main part has been separated from the facility management (FM) industry with long-term continuous operation. The information technology represented by BIM is the best media to integrate it, which makes the whole life cycle management a big step forward. Especially for the historical process of industrialization driven by information technology in contemporary China, it is of great significance to promote the development of the whole construction industry and facility management industry with the concept and vision of the whole life cycle. Based on BIM Technology, the integrated management system of visual facilities in Cigarette Factory integrates and manages the attribute information and spatial information of the whole life cycle of project facilities to realize the perceptible and visualized management of project facilities.

BIM visual management system integrates the industrial monitoring system. Managers can obtain various information of facilities in the virtual scene, organize production management and facility maintenance activities, simulate the production and maintenance process, and realize visual industrial monitoring.

The link relationship between facility equipment and pipeline is stored in the plant model builted by BIM. The link composed of facility equipment and pipeline corresponds to a professional subsystem or a part of the subsystem. In the system, a three-dimensional visualization oriented graph data model of each professional subsystem of cigarette factory is established. Through this function, managers can browse all professional subsystems in the three-dimensional visual environment, analyze the relevance and impact, and combine the data and real-time data of cigarette factory model integration to realize the fine management of facilities and equipment.

During the production of cigarette factory, the building structure facilities (such as walls, floors, roofs, etc.) and equipment facilities (such as equipment, pipes, etc.) need to be maintained continuously. A successful maintenance plan will improve the performance of facilities and equipment, reduce energy consumption and repair costs, thereby reducing overall maintenance costs. The integrated management system of visualized facilities based on BIM can give full play to the advantages of spatial positioning and data recording, reasonably make maintenance plans, assign special maintenance personnel, so as to
reduce the probability of unexpected situations in the use of facilities and equipment. Industrial monitoring system integrates with BIM system, provides the basis of real-time decision making for production management operation, and realizes more efficient management.

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