

Research on Using BIM Technology in Industrial Production Line Construction

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Abstract: The production line construction is an unavoidable problem in manufacturing industry. With the continuous development of information technology, BIM technology with data attributes is more and more widely used in engineering construction. BIM technology is the inevitable product of the in-depth integration of data technology, information technology and engineering construction technology. Starting from data, model, coordination and practice, information technology is applied to the design, construction, operation and maintenance of production line construction, and an engineering construction management model with a complete life cycle is deeply constructed. This paper first introduces BIM technology and its application value in production line construction, and then explains the practical application of BIM technology in production line construction from four aspects.

Keywords: BIM, Production line, Engineering construction.

1. Introduction

The construction of production line in the factory is the beginning of production. The design, planning and layout in the early stage of production line construction determine the quality of the whole production line. Nowadays, China is advancing towards a manufacturing power, and improving the level of production line construction is an essential part on the road to becoming a manufacturing power. The production line construction has the characteristics of large investment, many equipments and complicated process, which requires higher requirements for the previous work and increases the difficulty of on-site construction. To complete the construction of the production line in the shortest possible time, BIM technology should be fully used to effectively improve the on-site management level and operation efficiency of the production line construction, and it has achieved remarkable results in cost saving and shortening the construction period. In the process of production line construction, once the organization and coordination risks occur, it will bring a lot of losses to enterprises, so it is particularly important to study the application of BIM technology in production line construction.

2. Overview of 1.BIM Technology

BIM technology, called Building Information Modeling in full, or building information model in Chinese, is a data-based tool applied to engineering design, construction, and management. By integrating the data-based and information-based models of buildings, they are shared and transmitted during the life cycle of project construction, which is the basis for the cooperative work of all parties, with the aim of improving production efficiency, saving costs, and shortening the construction period. BIM technology not only simply integrates digital information, but more importantly, it applies digital information to design, construction, management, operation, and maintenance, and builds a closed loop of digital integrated management, which can improve the efficiency of project construction, effectively avoid risks, and complete the project construction ahead of schedule.

BIM technology has four main characteristics: first, visualization. From the point of view of production line construction, visualization plays a huge role. After obtaining the production line layout, the planar layout is transformed into a three-dimensional display diagram by BIM technology, which highlights the relevance, interaction, and feedback between machines, and can also generate reports to provide a basis for discussion and decision-making in the design, construction, and operation of production lines. Second, coordination. During the construction of any production line, all units need tacit cooperation, mutual coordination, and communication, and can discuss and decide the solution in time after encountering problems. The design stage of production line is affected by the lack of communication among professionals, which will inevitably slow down the construction process. BIM technology can effectively solve such problems, summarize possible problems and coordinate data, which can provide excellent coordination services for production line construction. Third, simulation.

BIM technology, which is generally used in building construction projects, can not only simulate the design in the process of building construction, but also simulate the indicators that are difficult to measure in the real world in the construction of production lines, such as energy saving in production lines, emergency plans, evacuation of firefighters and other experiments. Fourth, it can be plotted. There are some differences between BIM technology and conventional production line layout. The main advantage is to provide comprehensive layout, comprehensive structure and inspection and debugging report after visual display, cooperation, and simulation of production line. In this way, we can find relevant errors in the early stage of construction and make targeted modifications.

3. Application Value of BIM Technology in Industrial Production Line Construction

3.1. Deepen refined management

In the assembly line operation of the factory workshop, fine management is no stranger, and it is equally important in the

construction period of the production line, which can provide favorable support for the efficient operation of the production line later. The introduction of BIM technology can effectively promote refined management in the production line construction, and the use of BIM technology to build a digital model will help to form a complete circulation closed loop of business data, which will not only shorten the management chain, but also significantly improve the accuracy of production line construction engineering data and maximize the use of the obtained data. In addition, in the production line construction, different vested interests can communicate and transmit information through BIM model, which makes the coordination between different departments more efficient. Relying on BIM technology, diversified information will be integrated, and management measures will be infiltrated into the quality, safety, progress, information, cost, environmental protection and other aspects of production line construction, and the refined level of management will be continuously improved.

3.2. Promote the construction of intelligence

BIM technology has remarkable application efficiency in all aspects of production line construction, which can further improve the engineering design ability and technical level. In the design stage of production line, BIM technology is used to carry out modular design and defect inspection, and the problems existing in various machines and coordination interaction are solved in advance, which greatly saves the expenses caused by the subsequent production line failure and shutdown. When entering the production line construction stage, BIM technology can be used for the actual simulation of site layout and actual construction, so as to achieve the visual progress display in any direction of the above ground space and make multidimensional analysis through the simulation results to ensure the feasibility of the plans in each stage. Using virtual design, the cycle process of production line construction is predicted in all directions, and the controllability of construction is strengthened through accurate prior control.

4. Practice of BIM Technology in Industrial Production Line Construction

In the process of building production line, actively introducing BIM technology will help to refine the construction process, control the construction progress and cost more reasonably, and significantly improve the effectiveness of project management. The application of BIM technology is an effective driving force for the efficient construction of production lines, and how to effectively apply BIM technology to production line construction and give full play to its technical efficiency is a key issue that production line builders need to seriously study.

4.1. Create a digital ecology

BIM technology is a data tool, which fully integrates the relevant information of engineering construction through parameter model, providing strong data support for engineering construction. Establishing the digital ecology of production line from designers can accelerate the construction process. Some design and construction technicians did not fully realize the necessity of digital ecology and lacked uniform standards in the process of digital ecology

construction, which led to data confusion and high error rate, and failed to give full play to the maximum value of BIM technology. Therefore, it is necessary to clarify the data standards in advance, establish the corresponding BIM technology application standards based on the national BIM standards and their own conditions, and technicians should build the data ecology in strict accordance with the standards. The construction data of similar production lines are valuable data. Import this data into the database, and on this basis, combined with the basic characteristics of production line construction, decompose the construction work, and accurately establish the model to enhance the realistic effect. Comparative analysis of cases in the data, timely discover potential risks and list risks, and improve the virtual model. In this way, BIM technology can be used to improve the risk management efficiency and refined control level of production line engineering and build a good digital ecology.

4.2. Deepening the design of production line layout

During the construction of production line, design engineers usually only provide professional basis, drawings, and materials, which often leads to insufficient coordination among engineers, mutual interference, and design changes during construction, which increases the construction cost. Therefore, in the deepening design of the project, engineers need to carefully check the drawings, and give special instructions on the places where there are easy objections, to pay special attention to them in the process of compiling the construction plan. Taking the design of raw material stacking area of production line as an example, design engineers can use advanced layout design software to model, and then analyze the feasibility of each area to find unreasonable layout scheme in time to ensure the accuracy in the actual construction process and effectively reduce the error rate.

4.3. Monitor the production line construction process

In the traditional production line construction management, people, machines, materials, methods, and rings are all physical objects in the project implementation stage, which requires high coordination, delayed information transmission and untimely communication, resulting in uncoordinated, confused, and omitted design and implementation, which leads to changes and supplements. The application of BIM technology can effectively eliminate such problems. By building an integrated simulation platform, the related problems of design can be reviewed in advance. In practice, the production line enterprises put forward corresponding construction requirements to the design unit, which initially generates a virtual 3D model, then calculates the workload item by item, arranges the work progress plan, and incorporates it into the virtual 3D model after confirmation, which can provide an intuitive management basis for the general manager, dynamically manage resources, coordinate the construction progress, and achieve visual management and control of the whole construction process. Relying on BIM technology, simulating the construction organization and construction site can find out potential problems in time, solve them pertinently, flexibly adjust the scheme, minimize the probability of scheme change and the adverse impact of the change, and successfully complete the production line construction as planned.

5. Conclusion

To sum up, BIM technology is innovatively introduced in the process of production line construction, and a digital virtual model is established and applied to all aspects of production line construction, such as design, construction, operation, and maintenance, which improves the construction efficiency and reduces the probability of occurrence of risk events. At the same time, it effectively coordinates all stakeholders, realizes the interconnection of data and information in the construction process, strengthens the information communication among construction technicians, and greatly reduces the communication cost and the accident handling cost caused by poor communication. In the practical application of technology, it is necessary to dig out the effectiveness of BIM technology to the greatest extent by creating a digital ecology, deepening the design of production line layout, and monitoring the construction progress of production lines. In the future construction, enterprises with production line construction needs can embed estimation software and calculation program, which not only makes the construction management more accurate, but also can complete the work more efficiently. Under the background of developing green environment, we should further integrate green environmental protection information, better respond to the call of "Lucid waters and lush mountains are invaluable assets" and make the project construction and ecological

environment coexist harmoniously.

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