Bentley
Advancing Infrastructure

CASE STUDY

CCTEG's Intelligent Digital Design Supports Smart and Sustainable Mining at Xinjie Taigemiao Plant

Bentley's Integrated Technology Provided a Connected Data Environment and Reduced Design Changes by 26%

SECURING LONG-TERM COAL RESERVES THROUGH SUSTAINABLE MINING

Located in Ordos, Inner Mongolia, the Xinjie Taigemiao Mining area is one of the last under-developed, large-scale coal fields in the country's coal-rich Shaanxi region. Spanning approximately 8,000 square kilometers, the mining space holds 15.3 billion tons of estimated reserves. To capitalize on these reserves, Shenhua Xinjie Energy has planned to develop and construct eight coal mines, with an initial construction phase targeting 56 million tons per year. The mining facilities will extract and prepare coal for residential use and power generation, especially in coal-fired power plants. They will be built and operated with the use of intelligent, ecological, and sustainable engineering and mining concepts.

CCTEG Beijing Huayu Engineering's Digital Engineering Design Institute (CCTEG) is designing Xinjie Mine No. 2 in accordance with these green principles and advanced technology application. "The Xinjie Taigemiao Mining Area adopts digital design and state-of-the-art mining technologies to enable low-carbon mining, contributing to the global ecological environment and the national strategic goals of carbon peaking and carbon neutrality," explained Lihui He, vice president of Beijing Huayu Engineering. The design and construction of the mine and ancillary facilities strictly adhere to the development concepts of innovation, coordination, and eco-friendliness, requiring CCTEG to take multiple measures to use green electricity, save energy, and reduce carbon emissions.

ADDRESSING TECHNICAL ISSUES AND COORDINATION CHALLENGES

Xinjie Mine No. 2 covers 67.12 square kilometers and is being designed with an annual production capacity of 8 million tons over a 30-year operational period. Located in the north of the mining area, the plant features main and auxiliary air shafts, along with supporting equipment and facilities for coal preparation, water and power supply, and grouting, all arranged within the site. The large project scale presented complex processes and equipment layout, compounded by requirements to consider the integration of Mine No. 3. To optimize the plant arrangement while adhering to environmental standards, CCTEG needed to address technical issues related to construction, mine pressure prevention and control, water resource protection, and cooperative gas production.

Compounding the technical difficulties of the project were the multiple disciplines and data, requiring coordination and integration. The coal mine design involved a large number of engineering specialists from different departments that presented data sharing problems, as well as complex processes that traditionally require a lot of manpower. "During the early stages of design, the key is to unify material coding and standard setting, and clarify digital delivery requirements at different design stages to ensure that various professional teams can work together efficiently," said He. To ensure intelligent, eco-friendly design, construction, and operations, CCTEG needed collaborative BIM and advanced digital twin technology.

LEVERAGING OPEN MODELING AND DIGITAL TWIN TECHNOLOGY

"Guided by the digital intelligent design concept, the Xinjie No. 2 mine and coal preparation plant project uses Bentley software for BIM design, beginning with the feasibility study stage, which refers to unified standards, and runs through the preliminary design stage, construction drawing stage, and later construction and operation stages,"

PROJECT SUMMARY

ORGANIZATION

CCTEG Beijing Huayu Engineering Co., Ltd.

SOLUTION

Process and Power Generation

LOCATION

Ordos City, Inner Mongolia Autonomous Region, China

PROJECT OBJECTIVES

- To deliver a smart, sustainable, and eco-friendly mine at the Xinjie Taigemiao Mining Area in Inner Mongolia.
- To promote lifecycle digital intelligence for China's coal mining activities.

PROJECT PLAYBOOK

iTwin®, MicroStation®, OpenBuildings®, OpenPlant®, OpenRoads™, ProjectWise®

FAST FACTS

- Xinjie Mine No. 2 is part of the development of Inner Mongolia's Xinjie Taigemiao Mining Area to secure long-term coal reserves.
- CCTEG is designing the mine based on advanced technology and green, sustainable engineering and mining practices.
- Leveraging Bentley applications, CCTEG established a connected digital data environment and generated a 3D BIM delivery model.

ROI

- Working in a connected data environment reduced design coordination time by 20% and design changes by 26%.

> "Bentley's iTwin technology has helped establish the standard digital delivery system for China's coal design and build a unified delivery platform for participants to share and interact with BIM native data."
>
> *– Wang Xudong, Deputy General Manager of China Shenhua Xinjie Energy Co., Ltd.*

said He. Leveraging ProjectWise as the collaborative digital platform with Bentley Open™ applications and iTwin, CCTEG established a connected data environment, facilitating multidiscipline design and data integration to generate a BIM delivery model for use throughout the project lifecycle. The design team used MicroStation as the basic design software, and OpenPlant, OpenBuildings, and OpenRoads to perform pipeline, architectural, structural, and transportation planning and design.

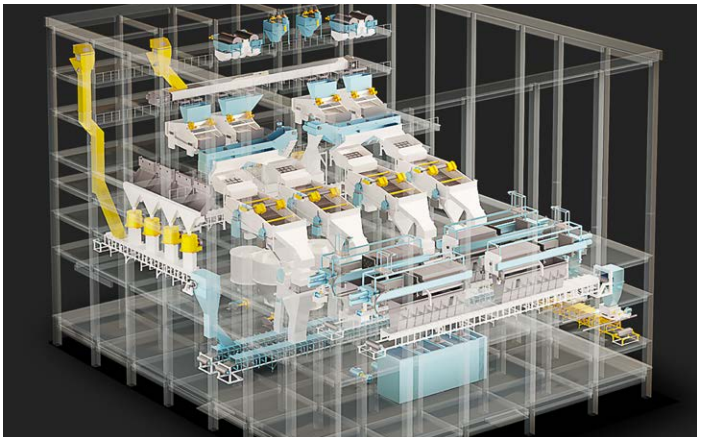
"The [Bentley] platform provides a unified digital design system that enables multiparty designs and data to be effectively integrated," explained He. The solution helped automate and streamline design, ensuring consistency, efficiency, and quality throughout the entire design process. During the disclosure stage, CCTEG used iTwin technology to achieve digital design delivery, facilitating the overall transfer and unified management of data assets and design versions from the initial stage to final design. By establishing a connected digital data environment utilizing advanced BIM technology and digital twin models, CCTEG facilitates full chain digital management, supporting their goals to digitalize traditional engineering and mining methods in China's mining sector.

DRIVING SAVINGS AND PROMOTING INTELLIGENT LIFECYCLE MINING SOLUTIONS

Working in Bentley's BIM platform reduced design coordination time by 20% and design changes by 26%. By combining real scenes with virtual models, a realistic and interactive geographical information map of the mining area is digitalized and accessible via a computer or mobile terminal. "This allows relevant personnel to obtain accurate and detailed information without arriving at the site in person, and then rely on digital twin technology to carry out simulation analysis and support decision making," explained He. Having a virtual visual model improved insight into the entire project, enabling the identification and resolution of issues prior to construction, avoiding rework and associated costs and delays.

The digital visualization and deliverables built based on Bentley technology provided the digital basis for CCTEG to develop an intelligent center management and control system. This platform is being used for the integration and collaboration of various control subsystems, eliminating human error, isolated information, and regulatory barriers. It provides a solid foundation for mine management via a single digital map. Now, manual tasks are transferred to machines and then dispatched and commanded remotely through the digital network, improving work efficiency while reducing accident risks.

"What's more, we practice the concept of green mines in an attempt to actively move closer to the digital ecology, carry out the mining design with reduced impacts to the ecological environment based on Bentley software, and enable all the advantages of developing complete equipment by a single subject to create an intelligent, safe, and efficient mine," said He. Through the application of Bentley's advanced technology and sustainable engineering and mining practices, CCTEG is establishing the Xinjie Taigemiao Mining Area as a benchmark project characterized by geological transparency, design digitization, optimal production, lean management, and an excellent ecological environment. "In short, many advantages brought by the movement toward digitalization in the mining sector will promote China's coal industry to become safer and more efficient," concluded He.



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The 3D model supports subsequent digital construction, operations, and management, promoting intelligent technology solutions within China's mining sector.