

China ENFI Engineering Develops Massive Waste Treatment Facility Completely Hidden from Residents

Bentley Applications Helped Them Design Underground While Improving Efficiency and Shortening Development Time

ALL TYPES OF WASTE, ONE FACILITY

A massive waste treatment facility was built to transform the Xiong'an New Area into a "waste-free city."

Now operational, the 220,000-square-meter facility processes 3,060 tons of garbage, kitchen waste, solid sewage, medical waste, and other waste types per day, addressing the waste generated by 6.5 million people. "This project is a project of 'putting waste into treasure and leaving it out, and making ecological integration and hidden ingenuity in the mountains and forests,'" said Zheng Peng, department director at China ENFI Engineering. The project is also the first batch of key projects launched in Xiong'an New Area, as well as a representative work of practicing the concept of "world vision, international standards, high point positioning, and Chinese features." China ENFI Engineering Corporation was tasked with providing digital services for the design and construction of the facility.

In addition to being able to handle waste from a variety of resources, this work is completely invisible to residents. That's because the project owners required the facility to be constructed underground and partially topped by a park. Every day, people walk over the hub of waste treatment without realizing it. The treatment process exceeds European Union standards for dust, sulfur dioxide, nitrogen oxides, and carbon-based compounds. Additionally, the owners have harnessed the treatment process for power generation, with a capacity of 214 gigawatts.

DESIGNING UNDERGROUND

Though China ENFI Engineering has a long history of engineering design, this project posed an unusual new concept for them. Usually, massive industrial complexes are not designed to be hidden from view underground. "It needs to hide the industrial production facilities in the spatial layout, which brings a series of technical problems, such as ventilation

in a confined space, underground logistics, special fire protection design, anti-floating and anti-seepage of groundwater level, whitening of flue gas discharged from chimneys, defogging of cooling towers in winter, and so on," said Peng. Further, the plant incorporates a mix of innovative technologies to process six different kinds of waste, all of which had to be arranged in an efficient manner.

The building facility totals 220,000 square meters. While large projects present their own challenges, China ENFI Engineering ran into space concerns, as the wide range of technology had to be incorporated into relatively tight spaces and work around thick support columns supporting the mountain above. Finally, the company had to manage an array of suppliers, specialists, and contractors, all within a short timeframe, and with all work meeting government delivery standards. Though the organization began with 2D design software, they quickly discovered it wasn't up to the task.

ONE PLATFORM FOR COLLABORATION AND DESIGN

China ENFI Engineering soon realized that using Bentley applications to establish digital workflows and design could help them meet the project requirements. "Bentley software must be used to quickly transform the designers' ideas into 3D data information models, turn a large number of complicated designs into intuitive virtual factories, strengthen the collaboration of more than 60 people from 13 specialties, reduce conflicts between specialties and improve the design quality and efficiency," said Peng. They first used ProjectWise to establish a connected data environment, bringing together all participants and ensuring up-to-date data and effective project management.

PROJECT SUMMARY ORGANIZATION

China ENFI Engineering Co., Ltd.

SOLUTION

Facilities, Campuses, and Cities

LOCATION

Xiong'an, Hebei, China

PROJECT OBJECTIVES

- ◆ To develop a single facility that could treat all waste produced by 6.5 million people.
- ◆ To determine how to develop the facility underground and in a relatively tight space.

PROJECT PLAYBOOK

AutoPIPE[®], Bentley Descartes[™], Bentley LumenRT[™], Bentley Raceway and Cable Management[™], iTwin[®], iTwin Capture, MicroStation[®], OpenBuildings[®], OpenPlant[®], OpenRoads[™], ProjectWise[®], ProStructures[™], SYNCHRO[™]

FAST FACTS

- ◆ The underground treatment plant aims to transform Xiong'an New Area into a "waste-free city."
- ◆ China ENFI Engineering quickly determined that 2D design was not sufficient to meet the needs of the project.
- ◆ With Bentley applications, they enabled all contributors to collaborate and develop 3D models.

ROI

- ◆ Digital design helped them improve design efficiency by 130% and greatly reduce error rates, detecting and solving 6,934 clashes before construction.
- ◆ Improved efficiency and visualization cut design time by 30 days and construction time by 50 days while lowering costs by CNY 13.7 million.
- ◆ The facility now lowers emissions by 50% to 80%, depending on the type.



“Bentley technology was used to realize the innovative application of deindustrialization and seamless design with a variety of industrial facilities hidden underground and country parks on the ground.”

– Zheng Peng, Director of BIM Digital Engineering Office of Energy, Environment and Urban Construction Division, China ENFI Engineering

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Next, they used OpenPlant as the main platform for 3D modeling, as it could enforce government requirements and solve previous issues with inconsistency. Using the application also enabled them to lay out pipes with very small diameters, and generate bills of materials from the design model. With OpenBuildings, they finalized their digital twin by combining elements needed for the project with the application's prefabricated component model library. Lastly, animations created from Bentley LumenRT assisted them with design reviews, as the visualization intuitively communicated design intent.

MEETING PROJECT REQUIREMENTS FASTER

Switching to 3D modeling and a digital workflow assisted China ENFI Engineering with arranging the diverse technology and designing necessary underground components, all within the relatively limited space. At the same time, they improved design efficiency by 130% and greatly reduced error

rates, detecting and solving 6,934 clashes before construction. Streamlined project management and improved coordination with ProjectWise cut the design time by 30 days. “In addition, the model was used for the first time to simulate the hardcover scheme of the main control room in the design process, so as to enhance the interaction between the owner's opinions and design intentions,” said Peng.

The project team continued to use the digital twin during construction, which was divided among eight different contractors. Having a single, understandable representation of the project greatly improved communication, reduced travel and labor costs, and avoided rework. As a result, builders saved CNY 13.7 million in costs and lowered the construction process by 50 days. The facility is now addressing the waste treatment needs for the entire city and lowering emissions by 50% to 80%, depending on the type.



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