Korea District Heating Engineering Designed and Built Combined Heat and Power Plant for Cleaner Energy Production

Bentley’s Applications Shortened Design Period by 1.5 Months

Investing in Cleaner Energy
Just south of Seoul, South Korea is the city of Osan, Gyeonggi-do. The city began looking for new, “clean” ways to produce enough energy for its 200,000 inhabitants with excellent performance and reliability. Combined heat and power (CHP) systems, also known as cogeneration, was the solution the city decided on. These systems generate electricity and useful thermal energy in a single, integrated system. Korea District Heating Engineering was responsible for designing and building the Osan Combined Heat and Power Plant, which will produce 474.4 megawatts of power to the surrounding area in a cleaner, more efficient way. The organization was also retained to standardize design methods for 3D pipe supports.

Improving Collaboration with 3D Models
Korea District Heating Engineering implemented collaborative 3D modeling when designing the system configuration. The project team implemented a basic and detailed design for the construction and preparation work, which would minimize expected design errors during the construction phase. The team also created visualizations of construction schedules and pre-construction simulations to share with other team members. These capabilities accelerated the decision-making process, as users had greater transparency to the timeline and final design, and they also minimized construction errors and delays. With the ability to access the 3D model at the work site, team members could access the updated design at any time.

With ProjectWise, the project team easily shared the design with appropriate users and stakeholders. The application allowed for collaboration and free communication across the entire team. It also created a single source of truth, securing revision management and data consistency to minimize design errors. Users reviewed and consulted with each other on the project’s status via the 3D model.

Standardizing 3D Pipe Supports
While constructing the plant, Korea District Heating Engineering realized that there was no standardization for designing 3D pipe supports and production drawings. To overcome this deficiency, team members created a standard 3D library for pipe supports using Bentley’s OpenPlant Support Engineering application, organizing the library by pipe support type, classification, and standard. The application was also used to generate standard production drawings and create automated quantity calculations.

Once established, the library could support design and construction deliverables created by hand, both the position and the isometric pipe drawings automatically marked the types of supports with unique numbering. Team members took advantage of automated generation of detailed pipe support lists, allowing for automatic calculations of pipe support quantity. By automating these systems, the project team maintained consistency across project documentation. Users could easily share the library with partner companies during 3D model design, reducing errors later in the project timeline and keeping all information in one location.

Creating an Efficient Plant with Accurate Design
Korea District Heating Engineering saw significant benefits by using Bentley applications, both during creation of the 3D model and construction. Now completed, the Osan Combined Heat and Power Plant consists of a heat cogeneration system that generates electricity and heat, a district heating and heat cogeneration system that supplies heat to consumers, and other supplementary facilities. Under multiple operation conditions, the combined power generation facility can produce about 474.4 megawatts of power, a thermal capacity of 280.6 gigacalories per hour in Mode I and 349 gigacalories per hour of heat in mode IV. The local heating supply system heats the water to 120 degrees Celsius in two local heating heat exchangers and sends it to the local heating supply facility to supply heat to each customer. To absorb the heat generated by the equipment within the power plant, the cooling water supply system supplies water in a closed cycle, providing cooling in the cooling tower before it is used for related equipment. The cooling tower consists of two poles and is a low-noise, hybrid type.
Using Digital Information
Data sharing also helped with collaboration among stakeholders and clients in real time. Using ProjectWise to help share documents, the project team saved on costs for printing 2D drawings, as well as the costs with sending and receiving those documents. By keeping everyone informed, the team created an accurate design, which further shortened the construction period.

Bentley’s 3D plant design solution shortened the pipeline support design period by about 1.5 months. Through the design of pipe supports and the automation of the drawings, efficiency of design and construction drawings improved by 20 percent. By implementing the 3D pipe support library, Korea District Heating Engineering increased business competitiveness and the value of digital information for power plant construction.