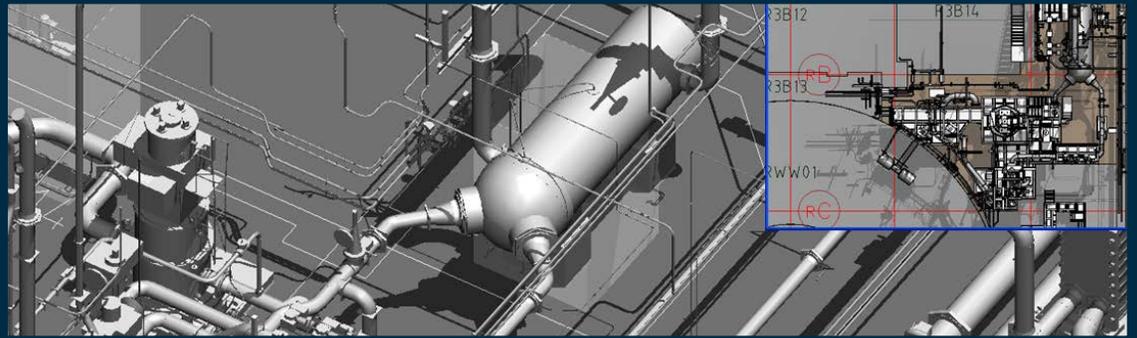




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Project Summary

Organization:
Hitachi-GE Nuclear Energy, Ltd.

Solution:
Power Generation

Location:
Hitachi, Ibaraki, Japan

Project Objective:

- Develop a user-oriented system to facilitate high quality and reliable power plant construction on time and at a reduced cost
- Give field workers reliable, easy access to clear, accurate visual construction information
- Plan projects more thoroughly using 3D and 4D visualization and simulations to reduce risk and streamline execution

Products used:

MicroStation

Fast Facts

- Hitachi chose to base its Integrated Plant Construction System on MicroStation because of its flexibility, extensibility, and interoperability support
- The system includes a 3D reviewing portal for the entire project, as well as visualizations for schedule simulation, planning, and work execution
- Workers record work as it is completed, resulting in updated plans

ROI

- Estimated 20 percent reduction in construction labor costs by eliminating inefficiencies and giving people anytime, anywhere access to the information they need to complete work
- Accurate, up-to-date progress reporting for better control
- Happier, more engaged personnel who are empowered to do their best

Hitachi-GE Nuclear Energy Builds MicroStation-powered Integrated Plant Construction System

4D Visualization Provides Intuitive, Comprehensive, and Efficient Construction Simulation

Developing a 4D Construction Visualization and Simulation System Based on MicroStation

Hitachi-GE Nuclear Energy, Ltd. specializes in the construction of high-quality, low-cost power plants that are both reliable and economical to operate. "Every project is large and complex, involving huge numbers of workers, detailed requirements, and materials," explained Masatoshi Takada, senior engineer at Hitachi-GE Nuclear Energy. "And because our work is downstream from design, we face hidden and extreme risks from less-than-optimal upstream work. At the same time, we need to manage all aspects of a project – piping, mechanical, electrical and so on across all project phases – and do so in a way that meets expected time, cost, and quality targets."

and procurement schedules to meet delivery targets and make adjustments based on project status."

To meet these needs, the company chose to use MicroStation because of its flexibility, extensibility to enable custom application development, and interoperability support for other legacy 3D software and construction systems. MicroStation also supports a hybrid graphic-and-tabular display that they could modify to make a very user-friendly interface for field workers to access detailed information presented in a very accessible, visual format. "This functionality would help us streamline and manage our construction process down to the required level of detail," stated Takada.

The Solution at Work

As a member of the Bentley Developer Network, Hitachi was able to use the MicroStation software development kit (SDK) to customize MicroStation and develop their Integrated Plant Construction System (IPCS). Through the Bentley Developer Network, developers who want to embed or extend functionality in Bentley products can easily do so with available development tools. Hitachi took a human-centered design approach when designing their IPCS, studying how their people really work and using the insights gained to develop just the right solution. Key components of the solution include the reviewing portal and modules for schedule planning and simulation, work instruction, and execution management and progress management.



Information can be explored intuitively in both list view and 3D graphical form.

This is no small task, even when building the smallest of power plants. Managing project risk and ensuring success requires that even the lowest-level task and process be managed closely and with the upmost precision. "To achieve this level of granularity of management and control, we need a system that supports integrated control and fine management of construction – and gives field workers reliable, easy access to clear, accurate construction information at the right time," explained Takada. "It must also enable us to tightly control and coordinate engineering

Reviewing Portal

The IPCS includes a visualization system, or reviewing portal, for all construction processes. It supports 3D viewing capabilities that project teams use to review designs and explore related information. "Information can be viewed in both list form and 3D graphical form so that it is easy for users to explore intuitively and not get lost," explained Takada. "For example, they can select a specific building, enter a specific floor, check out the layout, and select one room as a construction target, going into any level of detailed view. Even field workers using tablet PCs can navigate through layouts and access related documents using the 3D graphic portal.

“Using Bentley’s 3D modeling and visualization technology, everyone can see graphical depictions of the schedule for any project area and task, complete with dependencies.”

— Masatoshi Takada,
senior engineer,
Hitachi-GE Nuclear Energy

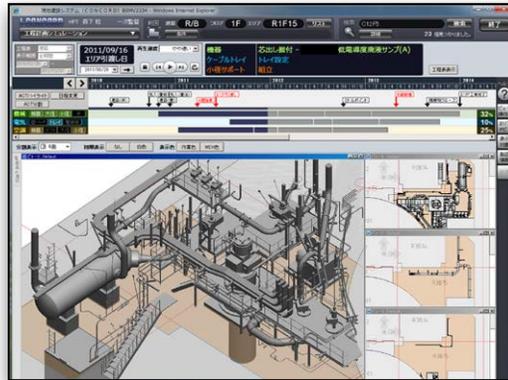
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Schedule Planning and Simulation

The IPCS also supports elaborate schedule planning, complete with a standard base area schedule for plant construction that allows teams to jump-start schedule development for specific projects. “Using Bentley’s 3D modeling and visualization technology, everyone can see graphical depictions of the schedule for any project area and task, complete with dependencies,” explained Takada. “This visual project plan can be easily understood by field workers so everyone can work together more effectively. They have just-in-time access to material and other information.”



The schedule and procedures can be planned and communicated visually.

IPCS is also used to create detailed simulations for civil coordination of construction yards, crane carrying operations, construction schedules, scaffolding erection and breakdown, operation floor lay-downs, and more. Planners and project managers can develop these detailed visualizations as guides for field workers, eliminating ambiguity about what needs to be done and how to do it in the most efficient and optimized way for a given project.

Work Instruction and Execution

Before the IPCS, planners and workers had to use paper drawings and instruction sheets to explain what had to be done. “However, plants are complex mazes, and it’s not easy to get information to the right place at the right

time,” added Takada. “With the IPCS, people can access the reviewing portal using a tablet and navigate to detailed work instructions, facility areas, components, and more. And once work is completed, they can update the system, which enables us to track progress visually.”

Hitachi-GE can now keep track of tens of thousands of work records, including who performed a specific task, when, and how it was executed – and have an up-to-date report on current progress and past progress. They can also use this data to make future plans and adjustments.

Realizing the Benefits

Hitachi-GE expects to realize a 20 percent reduction in construction labor costs thanks to the efficiencies and project control enabled by its MicroStation-powered IPCS. “About 40 percent of their work effort is spent searching for information, checking drawings, and preparation activities,” stated Takada. “We expect to cut this effort in half using the IPCS, which will result in significant reduction in overall costs.”

Project managers also have real-time insights into project progress, since field workers can update project plans as they complete their work. Takada has also seen a change in attitude among the company’s field workers. “Our on-site personnel now have reliable, easy access to clear and accurate construction information. They are more proactive and positive, always seeking to improve their own work,” he adds. “This is key to helping us deliver high quality, reliable power plants within budget and on schedule.”

Jun Miura, nuclear plant department manager, said, “We promoted the utilization of advanced information technology, including the full application of 3D CAD and the systematization of on-site works, to realize our construction-oriented EPC project. Our innovative approach introduces technologies that are based on a Human-centered Design methodology to unlock the true needs of users in the field. Moreover, it provides intuitive, comprehensive, and efficient construction simulation by means of 4D visualization. We have confirmed that this system will effectively serve construction-oriented EPC project requirements on a global basis and will continue to expand its deployment and use.”