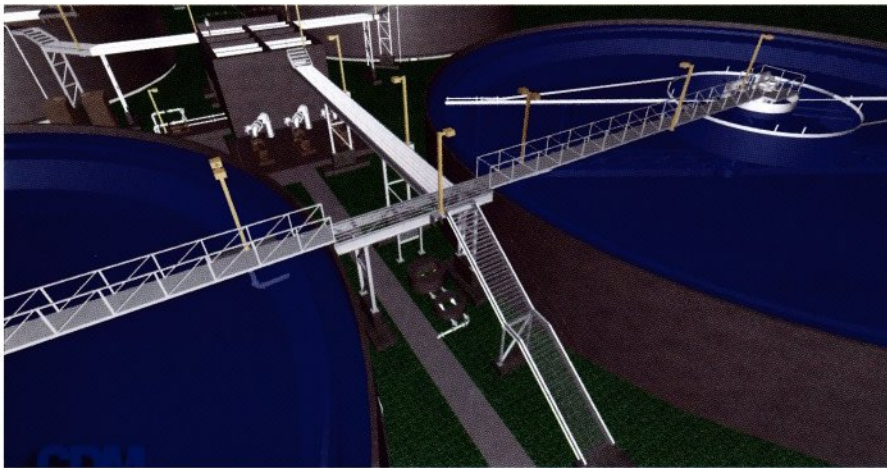


Smart technologies for infrastructure development

3D and 4D designs developed using Bentley products enabled CDM to develop intelligent plant design in a cost-effective manner using state-of-the-art technology



The facility was designed using intelligent 3D across all disciplines – architectural, civil, electrical, HVAC, instrumentation, plumbing, process, and structural – for more than 20 buildings and structures. The programme called for alternative, design-build delivery to meet an aggressive schedule. Final design had to be completed within 5.5 months of notice to proceed. To meet this short timeframe, the team needed to be able to quickly visualise the facility to agree on the form and function of the elements early in the design process.

Bentley software including AutoPLANT and STAAD.Pro enabled CDM to maximise staff skill sets and interact in a collaborative design environment to build the virtual facility.

Population growth and city expansion have become the order of the day today. As a city stretches its boundaries, it triggers the need to develop/expand the infrastructure to support the growing demand for utilities. The Okaloosa County in Florida met with a similar situation as drastic need was felt to increase its wastewater treatment facility to support the growing population. The county's earlier treatment plant at Garnier was more than 30 years old, treated only 6.5 million gallons of water per day, and was close to a school and residential area.

Okaloosa County teamed with CDM Constructors, Inc. to design and build a new, state-of-the-art wastewater treatment facility at Garniers spray field property. The new Arbennie Pritchett water reclamation facility will serve a population of 181,000 in the Florida panhandle, treating 10 million gallons of wastewater per day to stringent Florida Department of Environmental Protection standards. Costing US\$ 49.3 million, the facility will support resource conservation and economic development in this vibrant coastal community, including the military and civilian personnel at the Eglin Air Force Base.

A suite of Bentley software including AutoPLANT and STAAD.Pro enabled CDM to maximise staff skill sets and interact in a collaborative design environment to build the virtual facility. The project incorporated intelligent 4D design by integrating a living database into the 3D facility models, providing a lasting platform for efficient operations and maintenance. The 3D/4D approach allowed for the 3D models and intelligent data to continue through the full life cycle of the facility. ProjectWise helped CDM manage more





than 5,000 documents and provide the latest information to team members.

Deliverables from 3D/4D design approach met the expectations of both the project team and the client. "We knew going with a design-build approach would streamline the process. However, the 3D and 4D elements that CDM brought to the project have really taken the process to a new level. With each conversation or decision, we can see our new facility in real time," said Jeff Littrell, director of Okaloosa County Water & Sewer System. The firm met the aggressive design schedule, allowing construction to proceed on time by expediting the staff learning curve, providing superior design content, and achieving a collaborative environment with up-to-date, accurate, and real-time visual content throughout the design process. CDM's innovative design also enhanced sustainability by reducing power usage and operational costs through the improved treatment process.

CDM was able to maximise staff skill sets and interact in a collaborative design environment to build a virtual facility. Client meetings were much more productive, focussing on reviewing 3D models in lieu of 2D drawings. By commenting directly on the 3D models in real time, the owner provided valuable input, ensuring that expectations as well as the

project schedule and budget were met. The client could quickly visualise the facility and agree on the form and function of the elements early in the design process. "Bentley's products and services are built on providing 3D design and the associated 4D in a managed environment, which allowed us to deliver on the simple principle of providing our clients with a superior and more cost-effective project solution by utilising state-of-the-art technology in intelligent plant design," explained William Nelson, vice president of project technology development at CDM.

The software leveraged all intelligent component data within the central project database, such as on-demand custom valve schedules, instrumentation, equipment reports, and datasheets. Datasheets were easily populated from internal sources and vendors and then synchronised to the central database to repopulate AutoPLANT P&ID, maintaining consistent and current drawings and information. Custom datasheets, exploiting extended data capabilities in AutoPLANT, supported efficient procurement. Custom templates and data tokens allowed extended data on all instrument and equipment datasheets. This extended attribute database – with individual datasheets to break equipment into basic components – allowed

data export to the owner's computerised maintenance management system. Using a data-centric model connected to an enterprise-level electronic document management system, CDM thus provided a fourth dimension to the living facility model.

The integrated 4D model, O&M manuals, computerised maintenance management system, and process monitoring and control software provided seamless, complete facility integration. Equipment information and maintenance procedures can be updated in all databases, providing a real-time, sustainable tool supporting ongoing knowledge management and transfer, preserving continuity through any staff changes. Adding enhanced extended data from the design process, involving operations staff in all stages of the project, and avoiding redesign, made it easy to add asset management in the future. Best of all, the facility's 4D model will support efficient operations and knowledge transfer for generations to come.

Beginning at the conceptual stage, the integrated 3D model and collaborative environment resulted in 17 per cent reduction in man-hours for about 300 design drawings; a 30 per cent compression in the design schedule by using a collaborative rather than an iterative approach; minimised construction conflicts with quality deliverables; reduced re-engineering and redesign; and more effective team and client reviews. ■

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