Bentley
Sustaining Infrastructure

Gippsland Water Factory Alliance Uses AutoPLANT on Wastewater Treatment Facility

Sustainable Wastewater Treatment Infrastructure Ends 60-year-old Environmental Disaster

Project Summary

Organization
Gippsland Water

Solution
Water and Wastewater

Location
Maryvale, Victoria, Australia

Project Objectives
- Eliminate odor, corrosion, and capacity issues
- Provide a sustainable solution that benefits the community and environment
- Recycle wastewater for industrial and agricultural use
- Preserve fresh water resources

Products Used
- AutoPLANT P&ID
- AutoPLANT Piping
- Bentley Data Manager
- Bentley Datasheets
- Bentley Instrumentation and Wiring
- Bentley Vision
- ProSteel

Fast Facts

- Common database provided for engineers, draftsmen, and stakeholders
- 3D visualization enhanced design
- Bills of material automatically allowed procurement to be completed early
- Facility saves about three billion liters of fresh water each year

ROI

- The alliance saved 20 weeks of drafting work, which paid for software, training, and implementation
- Automatic isometric generation saved over five thousand hours
- Gippsland Water indicated the value of as-built 3D models for lifecycle asset management was immeasurable

Design a Sustainable Solution

Gippsland Water provides water and wastewater services to about 130,000 people in 41 towns throughout Central Gippsland, Victoria, Australia. For nearly 60 years, raw wastewater from nine towns and Australian Paper's Maryvale Mill discharged to a regional outfall sewer, causing serious odor, corrosion, and capacity issues. The (AUD) $260 million Gippsland Water Factory was designed to provide a sustainable and economically responsible solution. AutoPLANT, Bentley's premier plant design engineering suite, helped to keep costs down by streamlining workflows, reducing design time, facilitating procurement, and producing as-built models for lifecycle asset management.

The Gippsland Water Factory was delivered by a project alliance that included Gippsland Water, Transfield Services, CH2M HILL, and Parsons Brinckerhoff. The alliance partners worked collaboratively and shared equal responsibility for design, construction, and commissioning. Many factors made this ambitious project quite challenging. In addition to technical issues associated with treating the odiferous pulp-and-paper wastewater, the project alliance contended with the simultaneous construction of Australian Paper's (AUD) $500 million Maryvale Mill upgrade just one kilometer away. Intense political pressure to deliver the project on time and on budget called for a tight timeline, close coordination, and carefully planned construction schedules.

Partners Going Different Directions

Starting at Maryvale and extending east 87 kilometers to Dutson Downs, the 1950s-era regional outfall sewer was half concrete pipe and half earthen drain. The 41 kilometers of open drainage generated a significant stench, which in turn caused community outrage. The simple solution would have been to pipe the open drain. Instead, Gippsland Water took advantage of the opportunity to go beyond compliance and provide a sustainable solution that benefited the community and the environment.

The new wastewater treatment infrastructure, dubbed Gippsland Water Factory, included the Maryvale treatment plant, 78 kilometers of new pipeline, and eight new or upgraded pump stations. The project serves a population of 48,000 people in 11 towns.

With four alliance companies and a large multidiscipline team working on the project, there was significant risk that the partners would take the design in different directions using different products. This risk was realized in the early days of the project, after about 100 piping and instrumentation diagrams (P&IDs) were created. Using non-intelligent P&IDs caused a major problem as there was no consistency in 2D and 3D symbols, and there were both duplicate and incomplete asset tag information throughout the documentation. At the same time, manual lists were being created for equipment, valves, and instruments. The lists were out of date as soon as the P&IDs were updated, and there was no way to synchronize the diagrams and lists.

AutoPLANT Provides Integrated, Database-driven 2D/3D Design

To deliver this complex project on time and on budget, the Gippsland Water Factory Alliance needed design tools that would boost productivity, efficiency, and accuracy.

The alliance recognized that Bentley software would save time in both design and rework. "Early in the design process, we were heading in all different directions using different products and using AutoPLANT really did save us," said Mark Saunders, CAD manager, Gippsland Water.

The AutoPLANT suite of products was chosen as the common – and mandatory – design technology because it links to a central project database and generates intelligent 2D drawings and 3D models, from which bills of material and isometrics could be automatically generated. Mark Saunders explained, "Because there were four companies involved, each with a large number of staff, we realized it was critical for the project to have a central database that we could all access, enabling us to get the most up-to-date information at all times."

The first order of business was to recreate the 100 P&IDs using AutoPLANT P&ID to enforce consistency, standardize symbols, eliminate duplicate asset tags, and generate a live shared database across engineering disciplines. Details were added via Bentley Data Manager and Bentley Instrumentation and Wiring. This database was then used to rapidly create

"Gippsland Water Factory utilized proven Bentley products to deliver an innovative, sustainable, and socially responsible project that goes well beyond compliance."

— Ray Baillie, ICT Manager, Gippsland Water

consistent, accurate equipment, valve, and instrument lists for procurement and construction.

Having a common database gave multiple disciplines one source of truth. Drafting team members now used unique tag numbers and consistent CAD standards. Data was automatically entered in the project database from the P&IDs, and the instrumentation and control design team shared the same data. The mechanical team created equipment and valve lists for tendering and procurement. And the asset management team used the same data in the asset management software.

Plant Project Database Enhances Review and BOM Processing

Preliminary piping isometrics were issued to allow the construction team to have input, which was then incorporated into the construction drawings. Because piping isometrics were automatically checked when pipe specifications were created in AutoPLANT Piping, a basic review was all that was required, saving numerous man-hours. Once the design of each area was near completion, a bill of materials for pipe and pipe fittings was issued, so that the construction team could start sourcing materials.

Using AutoPLANT to automatically generate bill of materials from the database gave the construction team a head start procuring materials. Bills of material were issued to the construction team early in the design phase, and then to contractors and vendors before the drawings were issued. This enabled procurement to be completed early, ensuring no time lag for construction.

Intelligent 3D Models Provide Numerous Benefits

During detailed design, the project was divided into 65 separate 3D models that could be brought into a single review file. The review file was shared with all alliance partners and updated on a weekly basis. AutoPLANT Piping was used extensively, creating 10 separate 3D models. This enabled piping designers to work simultaneously in the separate models. The small file sizes allowed team members to review the models regardless of what computers they were using.

Bentley's database-driven design software also helped the drafting and engineering teams to work efficiently and ensure timely procurement. The 3D models enabled clash detection, facilitated design changes, and enforced consistency, so the design was up to date and correct when accessed by the engineers, draftsmen, and stakeholders. Team members were able to perform engineering reviews and hazardous operations studies throughout the project to determine the best engineering and construction outcomes.

Images generated from the 3D models also enhanced design of the state-of-the-art water treatment technology. During the public outreach program, the visuals helped to educate the community about the project's sustainable features.

The as-built models and database, with up-to-date engineering information, were ultimately transferred to the owner-operator, Gippsland Water. The engineering information database could be accessed and updated by Gippsland Water personnel.

By delivering intelligent 3D models with the infrastructure, the alliance provided a value-added package that could be used for ongoing maintenance and training throughout the 35-year lifecycle of the Gippsland Water Factory. Saunders added, "Now Gippsland Water not only has a state-of-the-art facility, but it can also maintain the integrity of this 'as-built' asset and use the engineering data for training, operations and maintenance."

Design Technology Saves Thousands of Hours

Standardizing on Bentley solutions provided an immediate return on investment, and helped the team deliver the project on time. "We created well over 1,000 P&IDs and using AutoPLANT probably saved us 20 weeks of drafting work," explained Saunders.

Bentley software was used to generate over 4,300 drawings, link more than 100 intelligent P&IDs to the project database, create more than 200 terminal connection details and 600 loop connection details, and create 450 datasheets. Saunders pointed out that, "The fact that we could easily create all those datasheets and electrical drawings allowed the instrumentation and control teams to deliver on time; otherwise they would have been well behind."

In addition, approximately 1,000 piping isometrics were created from the AutoPLANT Piping 3D models. It is estimated that up to five hours per isometric were saved by using the automatic isometric generation capability, rather than producing isometrics manually in a non-intelligent CAD environment. (Manual production typically took seven hours per isometric; automatic isometric generation took about two hours.)

Sustainable Solution for Recycling Wastewater

After nearly five years in progress, the Gippsland Water Factory became operational in April 2011 and now treats up to 35 million liters of domestic and industrial wastewater each day. The malodorous pulp-and-paper wastewater from the Maryvale Mill is treated with an innovative combination of technologies (an anaerobic / aerobic / membrane filtration treatment sequence) to minimize chemical inputs and maximize water quality. Domestic wastewater is treated separately using reverse osmosis to produce about eight million liters of extra high-quality recycled water each day.

Recycled water from the Gippsland Water Factory is sold to Australian Paper for use in industrial processes. As part of the project, wastewater from two other towns is piped to Dutson Downs for treatment and agricultural use. Wastewater that is not recycled is sent through the regional outfall sewer free of odor-causing organics and discharged to the ocean at Delray Beach.

The Gippsland Water Factory not only solves the previous problems associated with the regional outfall sewer but also saves about three billion liters of fresh water each year. By generating high-quality recycled water for industrial and agricultural use, the wastewater treatment complex ensures there will be more fresh water in the reservoirs and rivers serving 13 local towns.

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