

# Tapping the power of 3D design

*INVAP assembles 12-firm team to design and build nuclear reactor for research*



▲ More than 400 professionals worldwide in engineering, science, architecture, and construction collaborated on this Australian research facility, scheduled for completion in mid-2005.

In the foothills of the Andes lies the city of Bariloche, Argentina. A renowned tourist resort, Bariloche is also home to one of the world's most innovative and skilled engineering and research companies, INVAP (Investigación Aplicada).

INVAP is renowned for its advanced technical and administrative project control systems for nuclear, space, and industrial projects. Mostly because of INVAP, Argentina is recognized worldwide as a reliable supplier of nuclear facilities, as well as cobalt therapy and industrial automation equipment.

In July 2000 the Australian government chose INVAP from several leading suppliers for the engineering, construction, procurement, installation, and commissioning of a world-class nuclear research reactor near Sydney.

The Replacement Research Reactor is a multipurpose nuclear facility that will produce radioisotopes for medical and industrial applications, offer irradiation services, and serve as a prime research facility for experiments involving neutrons. Its benefits will extend to the areas of medicine, environment, industry, mining, agriculture, and science.

The reactor will not be a nuclear power plant in the normal sense: No electrical power will be produced. Therefore, the thermal power and radioactive inventory are several orders of magnitude lower than in a nuclear power plant.

### 3D helps design integration

Due to the size and complexity of the project, planning and delivery represented a major task. The project brought together more than 400

engineering, science, architecture, and construction professionals representing 12 design organizations around the world. INVAP recognized from the beginning the need to ensure proper integration of designs and systems.

In all, 50 major systems including civil, architecture, electrical, electronics, and mechanical and nuclear design were involved. Organizing and integrating the systems could have been a logistical nightmare.

Instead, INVAP used Bentley solutions to create an intelligent 3D model integrating the various designs, and analyzed the overall design for constructability, interferences, engineering analysis, and general operation and maintenance.

Adopting Bentley solutions early in the project let INVAP perform tasks it couldn't otherwise have accomplished, according to Alejandro Reybaud, the CAD manager responsible for developing and integrating the 3D model.

"The construction of the intelligent 3D model took us almost four years. However, the early implementation of Bentley tools produced a significant cost reduction compared with previous projects of the same scope completed by INVAP," he said.

These cost reductions stem from layout optimization and integration. The model also reduced site support personnel costs by 30 percent, by making information available to the construction site in a format that allowed planning and optimization of construction sequences and installation activities. Additionally, eliminating costly design changes and reworks allowed the project to proceed on schedule.



## Modeling benefits entire process

With a host of Bentley products including MicroStation V8, INVAP created the 3D model covering 15,000 square meters of civil works, and including more than 100 mechanical assemblies and components directly serving the nuclear core and its systems.

Modeling tools proved valuable in ensuring that the layout of the plant and overall integration proceeded smoothly, and that interferences were kept to a minimum. INVAP has also used the model to support the documentation and training process, Reybaud said.

“We’ve generated two gigabytes of photorealistic pictures from the model, to put in operation and design manuals. We’ve simulated inspection routes, component removal routes, escape routes, and maintenance cases. And we’ve produced thousands of images, as well as videos, to support multimedia presentations for training purposes.”

The 3D model helped the client understand and review the engineering information, and provided a better understanding of the different systems and areas within the reactor. It also let the client see how stringent safety, operation, and maintenance requirements had been addressed.

The \$180 million project is scheduled for completion in mid-2005. Reybaud says that INVAP is on target and that the client’s expectations have been exceeded. INVAP has improved its engineering production cycle, and looks forward to using Bentley solutions for all phases of future projects. ■

#### Project

Replacement Research Reactor Project

#### Organization

INVAP

#### BE Awards category

Plant Process Optimization

#### Project objectives

Create a \$180 million research nuclear reactor, from design to commissioning.

#### Fast facts

More than 400 professionals from 12 organizations worldwide collaborated on the project. A 3D model, nearly four years in the creation, integrated designs for 50 major systems.

#### Bentley products used

MicroStation  
MicroStation TriForma  
Architectural for TriForma  
HVAC for TriForma  
Structural for TriForma  
PlantSpace Piping  
PlantSpace Raceways  
PlantSpace Equipment  
Bentley Interference Manager  
PlantSpace SupportModeler  
MicroStation Schematics  
PlantSpace P&ID  
Bentley Navigator