



Bentley provides comprehensive software for the design, construction, and operation of the world's infrastructure, and has formed solutions communities to help users including those in oil and gas for upstream and downstream operations; power generation for nuclear, fossil fuel, combined cycle, and renewables; and mining and metals processing. Bentley's competitive advantage includes interoperable software says Mr. Atanu Pattanayak, Executive Industry Sales Director - Asia South, Bentley Systems while talking to Chief Editor, DEW

"Bentley's competitive advantage includes interoperable software"

Describe Bentley's involvement in India's oil, gas, and energy sector?

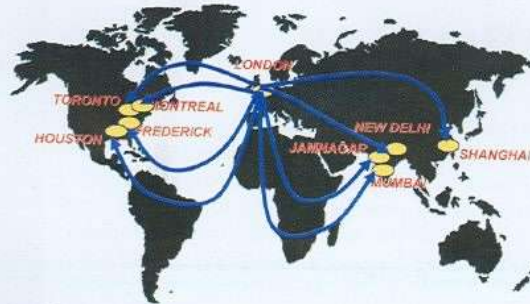
Let me first give your readers some background. Bentley provides comprehensive software for the design, construction, and operation of the world's infrastructure, and we have formed solutions communities to help our users including those in oil and gas for upstream and downstream operations; power generation for nuclear, fossil fuel, combined cycle, and renewables; and mining and metals processing.

These communities are headed by experts who have created a solution using products from Bentley's comprehensive software portfolio, in some cases integrating third-party applications. These products help organizations across the infrastructure lifecycle – from conceptual design, detailed engineering, construction, operations and maintenance, and decommissioning.

Our operation in India began in early 1997. Since then Bentley has grown from three colleagues in a single office to more than 225 colleagues and offices in Delhi, Mumbai, Chennai, Kolkata & Pune. Bentley's annual global revenues surpass \$500 million. In terms of percentage growth in sales over the past 3 years, India is



Engineering Deployment



the company's fastest-growing region. The same focus on solutions is in place in India, where we have experts in oil and gas, power generation, rail and transit, campuses, buildings, and geospatial to address local projects.

In the power generation market, we are currently involved with all nine major power projects in India and are working closely with either the owner-operators or EPC companies involved in those projects. Reliance Infrastructure, Tata Power, TCE Consulting Engineers, Toshiba, and L&T Power are just some of the companies Bentley is assisting with power projects. We are also actively monitoring the Indo-American Nuclear Pact so that we can bring our technology to nuclear power generation. In the oil and gas segment, we are associated with Reliance's Jamnagar expansion project, Cairn Energy, and the Essar Group, to name three.

Other than Reliance's Jamnagar project, who else in India and South Asia are Bentley's service and technology takers?

Bentley subscribers empower almost 90 percent of Engineering News-Record's Top Design Firms. Many of these companies work on oil and gas and power generation projects, have offices in India, and use Bentley solutions and products. They include Bechtel, Technip, Foster Wheeler, Fluor Daniel, Tecnimont, Mott MacDonald, ABB, Alstom, MWH, CH2M HILL, Jacobs Engineering Group, Aker Solutions, Uhde, and Siemens.

Among the India-based companies that use Bentley software are a number of plant consultancies and construction firms, including Larsen & Toubro, Engineers India Ltd., MECON, Essar Engineering, and Punj Lloyd. Our list of owner-operators using Bentley software includes the aforementioned Reliance and Essar, as well as ONGC, Hindalco, SAIL, and IOCL. The Reliance Jamnagar Export Refinery Project is just one of the many prestigious plant projects with which Bentley is associated. Other leading plant owner-operators that deploy Bentley solutions in the Asia South region are Petronas Malaysia, Shell Brunei, PTT Chemical Indonesia, Mitsubishi, British Petroleum Indonesia, and Singapore District Cooling.

Now, turning my attention to the transportation domain, we are proud to be associated with many prestigious projects such as the Golden Quadrilateral, Delhi Metro, and Mumbai Metro. In fact, we are the world leaders in the transportation domain and virtually all of the major companies in this field as well as a host of other MNC consultants use our products and solutions. These include National Highways Authority of India, MORTH, RITES, L&T Ramboll, Delhi Metro, and MMRDA.

For instance, organizations building India's major airport projects, such as those in Mumbai, Delhi, Bangalore, and Hyderabad, have used Bentley products directly or indirectly through the consultants they work with. In the building domain,

we count Airport Authority of India, L&T EDRC, and Mott MacDonald as our major users, while the retail sector includes companies like TESCO and Target.

In the geospatial domain, our major users include SOI and Indian Defense, as well as state government and municipal corporations like Navi Mumbai, BMC, Bangalore, Delhi, and others.

Bentley has been involved with Reliance world-ranking refining and petrochemical complex at Jamnagar. Can you throw light on this association?

The Reliance Jamnagar Export Refinery Project (JERP) is truly, without exaggeration, a marvel of engineering. JERP has a plot plan bigger than that of the city of London and a short target-completion time of less than 36 months. Therefore, the demanding schedule and enormous area has presented Bechtel with some very real challenges.

To meet them, Bechtel is tackling this megaproject using engineering resources dispersed around the globe, including a design and engineering team of 2,500 professionals in 10 design locations, 19 offices, and eight countries. In total, the project will employ more than 90,000 people during construction and call for the fabrication and installation of 109,170 metric tons of steel, about 5 million meters of varied size pipe, more than 4,000 pieces of major equipment, and more than 110,000 isometrics.

To successfully complete a project this vast in scope and widely distributed in so little time, Bechtel knew it would need unprecedented network connectivity, document access, and document control. Indeed, what enabled the project team to collaborate across design disciplines was deploying Bentley's ProjectWise for its CAD file management.

Project teams worldwide use ProjectWise to connect people and information throughout the infrastructure lifecycle. What ProjectWise does is allow architects, engineers, and contractors easily manage, find, share, and visualize CAD and geospatial content, project data, and Microsoft Office documents.

In the JERP project, Bechtel has 1,000 users in nine locations employing ProjectWise to ensure that more than 50,000 drawings are available to the right discipline at the correct location. With ProjectWise, designers can work on drawings in one location, while enabling



Reprocessing Plant

Effect of applied Bentley solution

- Increased productivity
 - Effective coordination and collaboration
 - Sharing and distribution of 3D design information
 - Minimization of reworks and duplication efforts
 - Improved design quality
 - Verify accessibility of main equipment before construction
 - Removal of hard and soft interference
 - Good communication with 3D design information
 - Production of 3D output with excellent quality
- Bentley solutions are also used for nuclear plant decommissioning. Japan Nuclear Fuels Ltd., for example, has effectively used our technology for this purpose.
- Integrated engineering system based on Bentley technology since 2002
 - Major 2D-3D legacy data translation
 - 3D decommissioning system based on MicroStation and

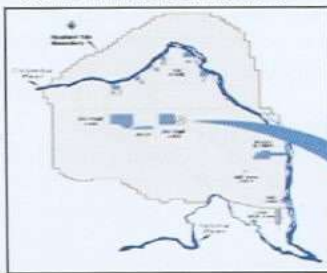


Uranium Enrichment

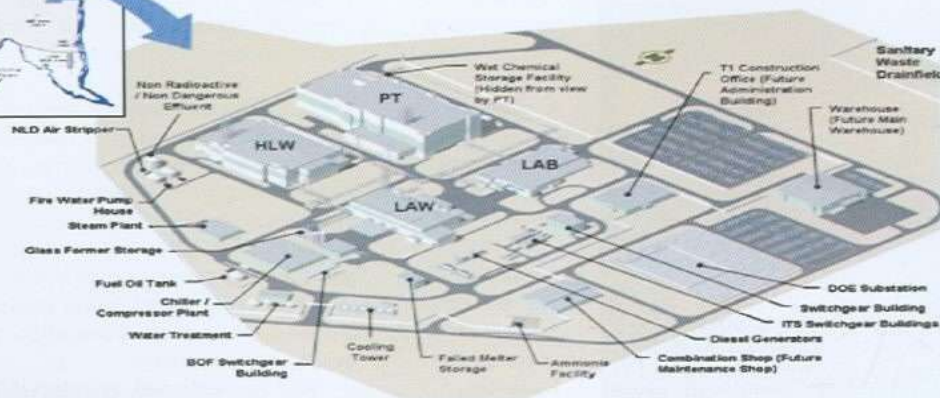
- Navigator
- Security and accountability documentation
- The other major nuclear power project with which Bentley associates itself with is the Bechtel, Hanford Waste Treatment Plant. Some of the highlights of this very large project include:
 - Fifty-three million gallons of radioactive liquid waste stored in 177 underground tanks
 - World's largest radioactive waste treatment vitrification plant
 - Complex project on the scale of two nuclear power plants
 - Distributed engineering environment, three design centres, and one of the largest ProjectWise deployments

The main benefit of using Bentley technology on this project is the risks minimised through:

- Distributed enterprise work sharing
- Remote collaboration of best available resources
- Associated construction with decommissioning
- Bentley is the only organization that can offer the complete solution for nuclear projects:
 - Plant design (all disciplines, full lifecycle)
 - Analysis
 - Content management
 - Collaboration
 - Handover
 - Publishing/records retention
- Lifecycle change management Solutions that can be applied to nuclear projects across the lifecycle include:
 - Power plant design
 - Fuel cycle (enrich/reprocess)
 - Waste treatment
 - Commissioning and M&O
 - Decommissioning



Vitrification Plant Project Site Location



designers at another location to see the results almost immediately. This means Bechtel can rapidly distribute the work to the different locations in a much more granular way – by unit, by discipline, and even by drawing – as the needs of the project dictate.

A key advantage realized by the project team is its ability to search for and find all files that were changed in the previous week, and to cross-reference the location of the files found with the location of the person who last changed them. What this does is enable the JERP team to regularly reassess and redistribute their project content, optimizing productivity and reducing network traffic.

JERP is an expansion of the refinery that Bechtel built 10 years ago for Reliance

Industries. Once it is completed, this new project will roughly double the size of the original Reliance Industries site, creating the world's largest refinery complex. By using ProjectWise to track and manage data, Bechtel has been able to facilitate the reuse of more than 25 percent of the design and engineering information generated during construction of the original facilities. This ability has proven to be critically important in meeting the project's aggressive timescale, while saving money in the process.

What are the unique benefits and potentials of applying Bentley's technology, services, and IT solutions in the field of oil, gas, and nuclear energy?

Bentley's competitive advantage includes interoperable software, the ability to collaborate in a distributed enterprise, subscription programs, and the company's position as market leader. Given the critical nature of AEC projects and the huge amount of capital tied up in them, Bentley's unique subscription programs enable organizations to be far more agile in responding to project opportunities and changes. For example, our Enterprise License Subscription (ELS) program offers unlimited training and anytime access to Bentley's entire software portfolio, letting subscribers instantly match their software and skills to new opportunities.

So you might ask, "Why Bentley Solutions?" It's simple, really. An adaptable business model requires and adaptable information model that includes:

- Distributed engineering
- Configuration management
- Data quality/handover

By offering our users this adaptable information model, Bentley's market leadership creates the following significant competitive advantages:

- Infrastructure software provides a single platform to support a broad range of products for all AEC needs. By doing so, it offers one-stop shopping for large organizations.
- And since AEC projects are increasingly global, software and support must also be global. Bentley's worldwide reach - 80 offices in 50 countries - provides a competitive advantage over smaller companies.

What, in your opinion, are some of the key technological issues India needs to address in its ever-expanding nuclear energy programme?

I'll need to defer that question to someone who has more expertise on nuclear technology. Nuclear power technology can often be indigenous or obtained from global companies like GE or Westinghouse. But I will say this: The major issues facing power-generation professionals is project execution, collaboration, data quality, and data reuse.

As I've mentioned, an adaptable business model requires an adaptable information model. Today's

projects must cope with distributed engineering. This must also take into consideration the multiple vendors involved. Some of the issues include configuration management, data quality, completeness of data handover, and the interoperability of software.

Further, nuclear power plant owners in India have to decide on a standard, such as ISO 15926. It is especially important in nuclear power plant operations that owners ensure the data created in the design, engineering, and construction phases can be reused during operation, maintenance, and decommissioning. To better serve our plant users, Bentley is developing applications based on the ISO 15926 international standard to enable data reuse across the entire lifecycle of the infrastructure.

As a company with nuclear energy expertise, what do you think are the factors that have made the nuclear energy market suddenly the buzz of the world?

The Energy Information Administration has predicted that from 2004 to 2030 demand for energy worldwide will increase 57 percent. At the same time, governments are establishing limits on the emission of carbon dioxide, nitrogen oxides, sulfur dioxide, particulate matter, and mercury. Therefore, power companies are seeking ways to get power from alternative energy processing plants onto the grid more quickly. Nuclear power is one viable option that companies are looking to. With the Indo-American Civilian Nuclear Cooperation Agreement in an advanced stage, the investment in nuclear power is estimated at \$70 billion in the next 10 years.

Most power plant owners and engineering companies in India have carved out plans to venture into nuclear power. Indian companies that have implemented plans include Reliance Infra, Tata, L&T, and TCE. The MNCs present in India are also gearing up for their share of the pie, and those not present want to open offices in India.

Can you throw some light on the Bentley 3D modeling technique that was used for the first time in the Korean nuclear power sector? How has this been a novel example?

Bentley has a strong market presence in the nuclear power industries in both Korea and Japan, with companies like Korea Power Engineering Co. (KOPEC), JNFL, Toyo Engineering, and Mitsubishi Heavy Industries all using our technology to design and construct nuclear plants.

Let's look at how KOPEC operates in this region:

- It is the only engineering company developing power plant technology in Korea under Korea Electric Power Co. (KEPCO).
- It is the sister company of Korea Hydro & Nuclear Power Co. (KHNP).
- It has developed the 1400 MWe APR1400 Nuclear Power Plant – the largest in its class in the world.

One KOPEC project is the Shin Kori Nuclear Power Plant, units 1 and 2, currently under construction on the south eastern coast of the Korean Peninsula. It is a two-loop, light-water moderated and cooled, pressurized-water reactor system rated at 2,825 megawatts with an electricity output of 1,000 megawatts. KOPEC, as the prime contractor, is providing KEPCO with architectural and engineering services for the entire project.

KOPEC is using PlantSpace, Bentley's 3D modeling application, to design the plant. This marks the first time 3D modeling has been used to construct a Korean nuclear power plant. The conceptual 3D model layout is the most important factor in optimizing construction and is the starting point of the 3D model structure. Each unit comprises 3,300 pieces of equipment, about 350,000 feet of piping and 5,400 piping supports.

Bentley software has helped define volume areas and levels in buildings, design piping components, and check clashes. Another benefit our software provides is that it can properly check the design when an interference induced by thermal movement of high-temperature piping needs to be investigated. PlantSpace also provides visualization improvements that include using animation and simulation to optimize construction and operation and maintenance in the design stage. Visualizing a schedule simulation can also verify constructability and review operating and maintenance procedures. dewjournal.com

