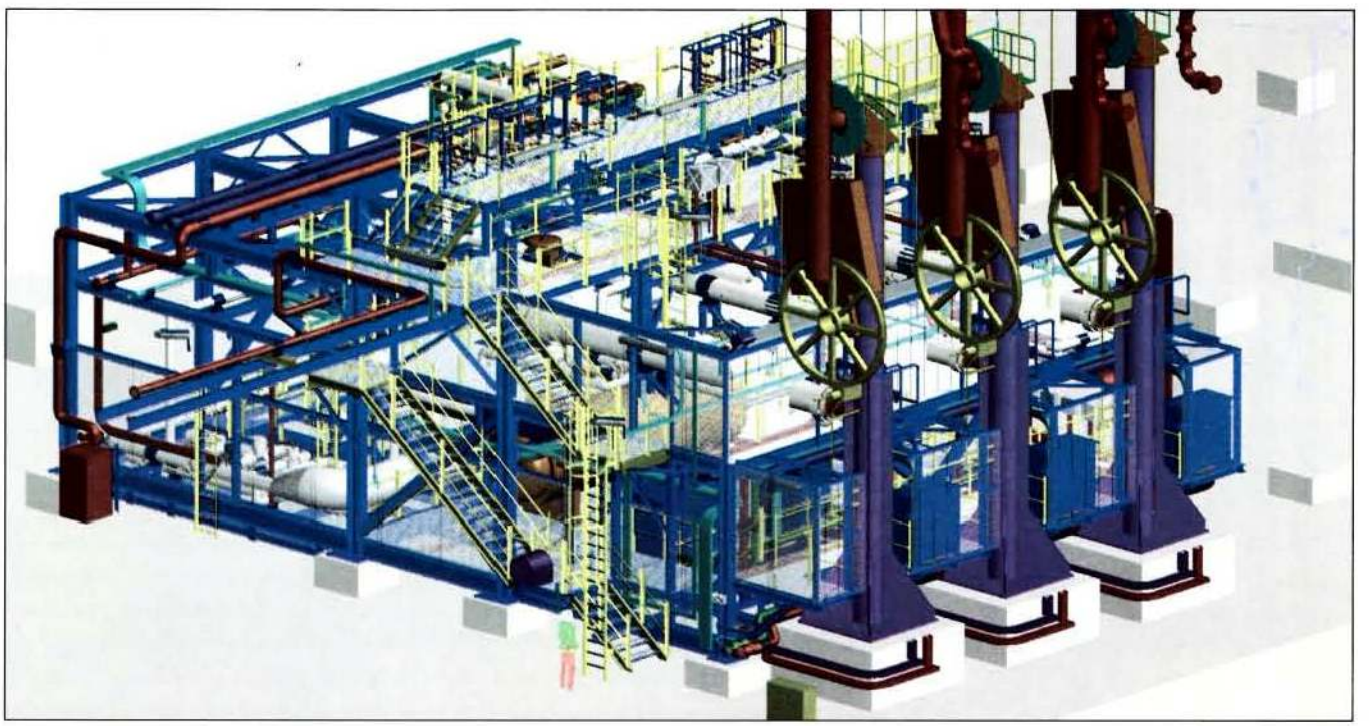
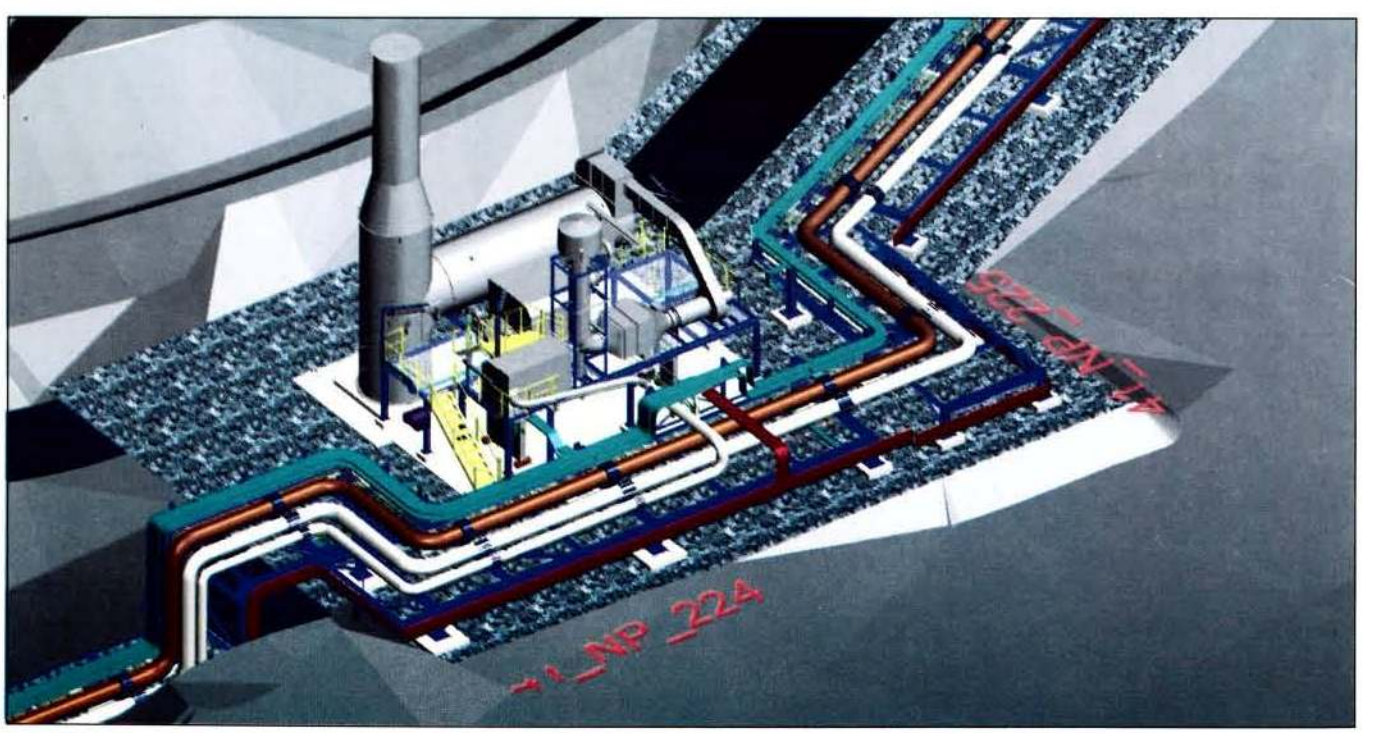
Terminal pumps natural gas through longest subsea pipeline

A Report by Bentley

Engineers in northernmost terminal overcome Arctic conditions and a short construction season. Although 3,000 workers endured four years living under extreme Arctic conditions on the Island of Melkoya, Norway, to develop the first off-shore natural gas production facility in the Barents Sea,

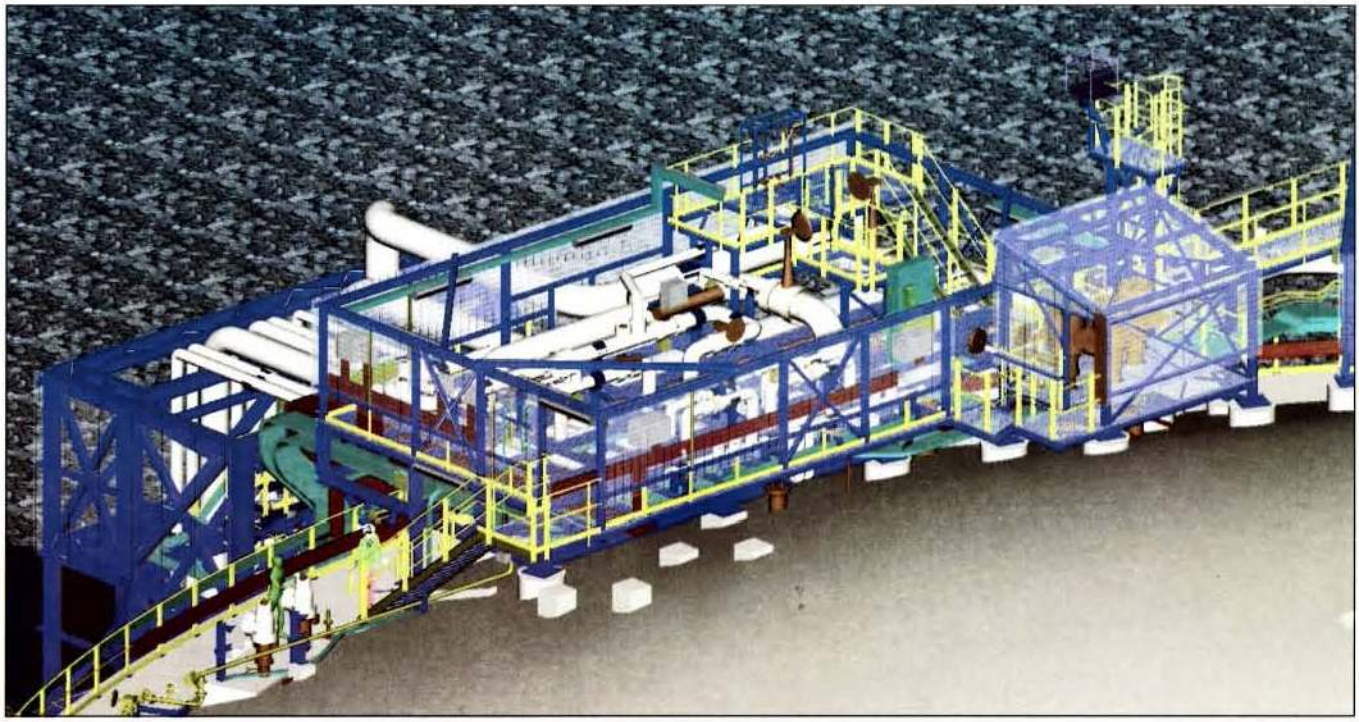


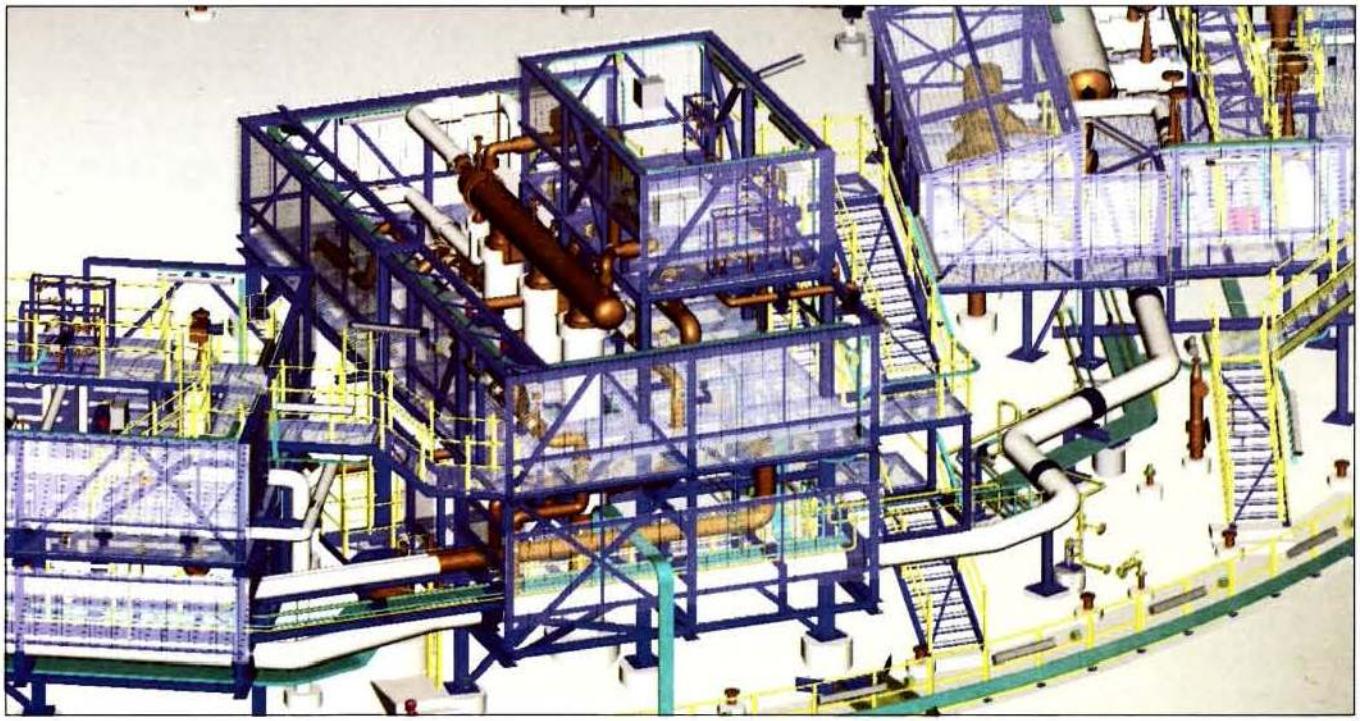


The following is a case study from Bentley on how the design team at SUEZ Tractebel Engineering (Brussels, Belgium), an engineering services provider for the energy sector and a leading designer of LNG terminals used Bentley solutions to generate 74 piping models, 20 equipment models, 84 structural models, and 1,500 isometrics to complete the $7.5 billion project which is a remotely operated seabed installation with a sub sea pipeline carrying natural gas to the Snohvit liquid natural gas (LNG) terminal.

there is no visible surface evidence of their labor. Located 140 kilometers north of Hammerfest, the world's northernmost city, the $7.5 billion project is a remotely operated seabed installation with a subsea pipeline carrying natural gas to the Snohvit liquid natural gas (LNG) terminal.

The Snohvit project includes





three fields - Snohvit, Albatross, and Askeladd - in the Hammerfest Basin of the Barents Sea. First discovered in 1984, Snohvit's recoverable reserves are now estimated at 193 billion cubic meters of natural gas, 113 million barrels of condensate, and 5.1 million tons of natural gas liquids. New developments in subsea gas extraction and gas liquification technology have enabled the three gas fields to be developed by a consortium of companies, including Statoil as the primary owner-operator with a 34 percent interest in the project. The Norwegian government approved development of the Snohvit fields in 2002 and construction began in 2003.

The Snohvit production facilities are located on the seabed in water depths of 250 to 345 meters. A 143-kilometer subsea pipeline transports the well flow to the LNG terminal on Melkoya where it is separated into natural gas and condensate. The CO2 that makes up about 5 to 8 percent of the unprocessed gas is also separated out and returned to the field via another pipeline for reinjection. This prevents excess CO2 emissions and enables Norway to adhere to the Kyoto treaty.

At the liquification plant, which was built on a prefabricated gas liquification barge to reduce the need for costly steelwork on the island, advanced refrigeration technology cools the natural gas to a temperature of -163 degrees Celsius. This causes the gas to liquefy and shrink in volume by a factor of 600. Statoil reports that 12 doctoral studies contributed to the refrigeration process developed to liquefy natural gas at extreme temperatures. Operating in the cold Arctic climate boosts the plant's energy efficiency, making it one of the most efficient in the world.

In liquid form, the natural gas can be stored at the terminal before being transferred to specially designed LNG tankers for shipment to stocking terminals in Europe and the United States. The LNG is then regasified for delivery through the natural gas transportation and distribution network.

SUEZ Tractebel Engineering (Brussels, Belgium), an engineering services provider for the energy sector and a leading designer of LNG terminals, designed the pipeline and four storage tanks: two 125,000-cubic-meter tanks for LNG, one 75,000-cubic-meter tank for condensate (light oil), and one 45,000-cubic-meter tank for liquefied petroleum gas. The firm also designed the jetty where the tankers load the LNG.

Using PlantSpace and Bentley Structural building information modeling applications, the design team generated 74 piping models, 20 equipment models, 84 structural models, and 1,500 isometrics. ProjectWise facilitated communication among all team members so the construction timelines could be met.

Hampered by Arctic conditions and a short construction season, engineers working on this complex installation faced significant challenges, not to mention tight deadlines. "The low temperature was the first problem, and thus construction timelines were very tight," explained Eric Mahy, IT engineering systems manager at SUEZ Tractebel. "With the compliance deadlines, complexity of the installation, lack of space for the plant, and life on site for the project team, communication among all the partners was essential."

The Snohvit terminal shipped its first cargo in October 2007, becoming Europe's first LNG export facility. Statoil expects annual shipments of 70 cargos totaling 6 billion cubic meters per year. Headquartered in Stavanger, Norway, Statoil has partnered with Petoro, Total E&P Norge AS, Gaz de France, Hess Norge, and RWE Dea AG to develop the fields over the next 25 years. By investing in LNG, these energy companies are diversifying the natural gas supply and contributing to the energy security of Europe and the US. dewjournal.com