DESIGNING SUBSEA PIPELINES

WORLD-CLASS PROJECTS
FROM EARLY PHASE STUDIES TO OPERATION

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PIPELINE SYSTEMS

Ramboll Oil & Gas has carried out some of the most challenging pipeline projects in the world

Subsea pipelines are a safe and reliable way to transport energy from offshore fields to onshore terminals and further on to end-users. As energy consumption increases worldwide, offshore exploration moves towards even deeper reservoir pockets and the need for improving the design of high pressure/high temperature (HPHT) pipelines is evident.

State-of-the-art solutions

At Ramboll we have more than three decades of experience with offshore infrastructure systems at all levels. Today we are a major player in designing complex HPHT pipelines from detailed design to installation and maintenance. In fact, we have designed some of the most challenging pipeline systems in the world using state-of-the-art solutions and technical engineering tools, adopted to provide cost-effective and robust solutions for our clients.

HPHT pipeline challenges

HPHT pipelines are complex pipeline systems that differ significantly from traditional pipeline design. Inside HPHT pipelines the pressure is 300-500 bar and fluid temperatures range from 120 to 160 degrees Celsius.

Because of often highly uneven seabed terrain, the pipelines merely rest on “mountains” with free spans of 50-100 metres. This poses great challenges to the design of the pipeline where the choice of material is core as it must be able to resist internal corrosion. Some pipelines may be provided with thermal insulation to prevent hydrate formation inside the pipeline and/or electrical heating system to heat the multiphase fluid in the pipeline.

Another challenge is the installation of the pipelines in deep waters. Using divers is not an option and therefore all subsea installation work has to be engineered by using unmanned remotely operated vehicles.

Environmental assessment

The environmental impact is a significant consideration for the design and construction of the pipelines. Therefore we perform highly professional environmental impact assessments (EIA) to review the impact on flora and fauna as part of the offshore development.

Modelling the pipeline

At Ramboll we have developed a highly specialised software package called Goliat (General Offshore Linepipe Analysis Tool) which makes it possible to model the full pipeline history from installation, flooding, system pressure test to operational condition by using a full 3D of the pipeline.

By using specialised programs and systems for integrated model analyses, we are able to ensure realistic loading and static and fatigue analyses that conform to internationally approved design codes.

Multidisciplinary expert teams

As a multidisciplinary international engineering and design company, we are able to offer services for all phases of a project’s lifecycle.

We always set the best team for a given project and are able to draw on vast experience throughout our organisation for instance within HSEQ management, geotechnical engineering, environmental assessment, software development, project and construction management and financial consultancy.

Contact information

For further information please contact

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SELECTED REFERENCES

TYRIHANS
- HPHT FIELD DEVELOPMENT
Tyrihans, a Statoil operated field in the North Sea, is rated as one of the top five pipeline projects in the world.

Our scope of work included engineering services from FEED followed by detailed design and follow-on engineering during the planning and construction phase.

Year: 2004-2010
43 km 16”/18” multiphase production pipeline
43 km 10” gas injection pipeline
Water depth: 275 - 310 m
Estimated reserves: 866 million barrels of oil and condensate and 415 million standard cubic metres of gas.

Direct Electrical Heating system

GUDDRUN
- HPHT FIELD DEVELOPMENT
The Gudrun field, located 45 kilometres west of Sognafjellet in the Norwegian Trench, is an example of our design capabilities within large and complex subsea pipeline projects.

For the Gudrun project we have performed detailed design and follow-on engineering. The construction work is nearly completed and Gjøa field is expected on stream in 2010.

Year: 2007-2010
18 km in-field pipelines
131 km 28” gas export pipeline
55 km 16” oil export pipeline
Water depth: 150-380 m
Estimated reserves: 242 million barrels of oil and condensate and 40 billion cubic metres of gas.

Pipeline end structures, GRP protection structures

J-tube pull-in.

Pre-installed risers and protection structures

ABOUT RAMBOLL

Ramboll is a leading engineering, design and consultancy company founded in Denmark in 1945. We employ close to 10,000 experts and have a significant presence in Northern Europe, Russia, India and the Middle East. With more than 200 offices in 19 countries, we emphasise local experience combined with a global knowledge base. We constantly strive to achieve rigorous solutions that make a genuine difference to our clients, the end-users and society.

The business unit Ramboll Oil & Gas provides highly specialised engineering consultancy services to the global oil and gas industry. We have worked in the industry since the 1970s, and employ close to 1,000 dedicated oil and gas specialists.