



Innovative Cable Stay Technology

Dong Siri Oil Platform, North Sea, Denmark

Client

Dong Energy

Offshore Contractor

Subsea

Engineering Consultancy

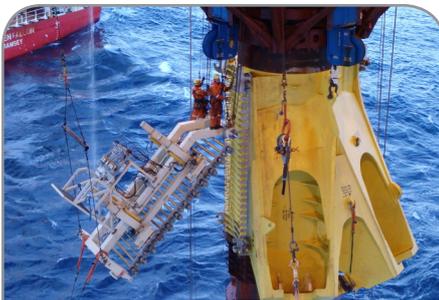
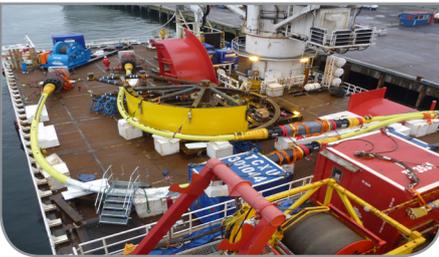
Atkins

Collaborators

Freyssinet Ltd, Freyssinet
International & Cie/VINCI
Construction

Works Completed

June 2014



The Siri oil platform is a production jack-up, anchored in the North Sea 220km off the coast of Denmark. In 2009, an detected cracks in the support structure and unsatisfactory fatigue life in the legs where they were connected into the base on the seabed.

While a solution was sort, imposed limitations on platform operations were causing loss of production under inclement weather conditions. The need to fully evacuate the platform when wave heights reached an imposed threshold was also a safety concern and further reducing revenue. The initial plan to use steel K-bracing to strengthen to structure was ruled out, as it appeared so costly and difficult to carry out without interrupting production. Serious consideration was given to abandoning and decommissioning the platform if a cheaper and safer solution could not be found.

As a world leader in onshore cable technology, Freyssinet was approached by engineering consultant Atkins in 2010 about the feasibility of a strengthening scheme using cables to cross brace the legs of the platform. The solution would be lighter, easier to install and critically, could be implemented offshore which would be a major cost saving benefit.

The requirements of the project included:

- To provide load capacity in a single cable of approximately 5,000 tonnes
- Cable lengths - 60m, fully prefabricated
- A design life of 15 years in marine environment
- To be able to withstand the varying load from the platform under severe wave loading
- Anchorages fully watertight under test pressure of 10 bar (100m water depth equivalent) giving a safety factor of almost three in operation.
- Strength, fatigue and multi-layer corrosion protection performance to the satisfaction of Dong and under the stringent requirements of DNV (Offshore Certification Body)

Although not suitable for use as it was, the Freyssinet H2000 stay cable is a modular system where the load carrying member is a group of parallel strands, each with an ultimate capacity of around 28 tonnes. Freyssinet carried out specific development work to find the most effective solution in terms of load-bearing capacity, corrosion protection of the anchorages, life span and fatigue resistance. The final cables selected were comprised of 169 strands with a total failing load of 4,800 tonnes.

The project required an innovative approach, and therefore the solution included:

- Fully prefabricated tension bracing cables adapted from Freyssinet Cable Stay Technology
- 60m long, 169 strands (350mm diameter)
- Capacity 5,000 tonnes
- Watertight to 10 bar (proven by full scale testing)
- Full fatigue analysis with design life >15 years under extreme wave loading

After tests on small-scale and then a full-size models to fine-tune specific adaptations (corrosion-protection filling of the anchorages, protection of the crossing points, etc.), the Freyssinet strengthening system - the first ever fully waterproof post tensioned retro fit system applied to an oil rig, was installed on the platform in June 2014. The platform is now fully serviceable and reports are that it is more stable under heavy seas and therefore much more comfortable for the personnel on-board.

The level of innovation that went into the design, prefabrication and ultimately the installation of the Siri Cables was truly impressive, and as a result the project was awarded the Grand Prize at the Vinci Innovation Awards 2015 for unprecedented application of cable stays.

Freyssinet Ltd. Innovation House, Euston Way, Town Centre, Telford, Shropshire, TF3 4LT
Phone +44 (0) 1952 201901 Fax +44 (0) 1952 201753 Email info@freyssinet.co.uk