Installation: Dogger Bank Meteorological Mast

The Project

In October 2011 Universal Foundation Norway (previously Fred. Olsen United) was awarded the contract for the turnkey installation of two meteorological masts at Forewind's Dogger Bank offshore wind site off the East of England. The contract incorporated Universal Foundation’s revolutionary and innovative Mono Bucket foundation and was delivered by Fred. Olsen related partners.

The installation and commissioning was completed in September 2013. It was the first project of its kind and a key milestone in the commercialisation of the foundation technology, achieving cost and time saving goals and noise reduction targets.

Delivery Partners

The contract was delivered in partnership with six Fred. Olsen related companies:

- Universal Foundation Norway - turnkey contract management
- Universal Foundation Denmark - design engineering and installation procedure
- Harland and Wolff - production engineering, material procurement and fabrication
- Fred. Olsen Windcarrier - transportation and installation
- SeaRoc - meteorological mast design, engineering and fabrication
- Global Wind Service - technical manpower

Design and Development

First devised in Aalborg, Denmark, the Mono Bucket foundation has undergone more than a decade of design, research and development.

The Mono Bucket combines the key physical characteristics of both monopile and gravity based structures to reduce the total system weight by 20 - 30%. The simple design ensures a cost effective solution for both fabrication and installation and is industry-leading with its low impact on the environment.

The foundation installation concept uses a jet and suction system as the driving force. Lowering the pressure in the cavity between the foundation and the seabed generates water flow, which lowers resistance around the edge of the foundation’s skirt. This reduces resistance and allows seabed penetration.

"With our patented system we can control the vertical alignment of the foundation and position it well within the prescribed tolerance" - Søren Nielsen, Chief Technical Officer, Universal Foundation Denmark.

Fabrication and Assembly

All production engineering, procurement, fabrication and load-out (including sea-fastening) of the two structures were undertaken at Harland and Wolff’s facility in Belfast.
Fabrication included the manufacture of four main sub-assemblies, skirt, lid, shaft and platform, which were then brought together on the quayside before pre-commissioning, testing and load-out on to Fred. Olsen Windcarrier’s Brave Tern, using teams from Harland and Wolff, Global Wind Service and SeaRoc.

Project Manager Ken Hawkins said everything went exactly as intended: "We are investing heavily in new facilities and equipment to ensure we can continue to drive down costs while enhancing our capacity and the quality of the product."

**Delivery and Installation**

Both foundations were delivered and installed by the Brave Tern - one of two new custom-built jack-up vessels designed specifically for the offshore wind market. Both operations were completed smoothly by the Universal Foundation and Global Wind Service teams without incident or injury.

During the first installation on Dogger Bank West the foundation base was slightly damaged due to unsuitable installation procedure. The foundation was successfully retrieved and it was decided to return it to the marshaling site for repairs. By adjusting the procedures according to the valuable lessons learned from the first installation attempt, the Dogger Bank East foundation was successfully and safely installed. The repaired Dogger Bank West foundation was taken back to site in late September and successfully installed in a record breaking 7 hours. Once anchored in place, the structures formed solid foundations for the meteorological masts designed by SeaRoc Ltd.

The 93m lattice towers were manoeuvered into place using a system of specially designed guide cones which enable the crew to stay on deck and avoid lifting hazards. The minimal human intervention process was developed during design of the met. masts and was an offshore wind industry first.

**Support**

The Universal Foundation development has been supported by the Carbon Trust’s Offshore Wind Accelerator programme, which takes the best concepts for offshore wind turbine foundations from design to deployment.

“It is a really great innovation for the industry as you can install it faster and at lower costs than conventional foundations,” said Phil de Villiers, of the Carbon Trust.

He estimates the foundation could save developers more than £5bn if used for the 6,000 turbines planned in the next decade.

**Achievements**

The Dogger Bank project was an important demonstration of the capabilities of Fred. Olsen related companies and a major step in proving the Mono Bucket as it progresses towards full commercialisation.

The project provided valuable procedural learning with adjustments to mitigate project risks and ensure increased reliability in project execution ensuring further successes in the future.

“The close collaboration throughout the project with all four partners in the Forewind consortium proved that Fred. Olsen related companies can and will be a major player in the offshore wind industry in the future and an industry leader in health and safety and performance offshore” - Lars Kjuul Kristensen - Senior Project Manager, Universal Foundation Norway.