

The “human free” met mast installation

About Forewind

Forewind Limited is a consortium of four leading international energy companies – RWE, SSE, Statoil and Statkraft - committed to securing the necessary consents required for the construction and development of offshore wind farms within the Dogger Bank Zone.

Its mission is to: *Achieve development consent for a minimum of 9GW of safe, technically deliverable and economically viable offshore wind capacity on the Dogger Bank that will provide an attractive opportunity for investors.*

HSE initiative description

The Dogger Bank meteorological mast project was the first in the UK to use a “human-free” technique to place the lattice tower of the mast on top of the awaiting foundation.

Lightweight plastic cones and video cameras were affixed to the tower sections prior to any lifting activity, which alleviated the need for riggers to physically be in position for the task of manoeuvring the towers into place. This was both safer than traditional methods, as it enabled the crew to stay on deck away from the lifting hazards, and also much faster as the cones helped to quickly stabilise the load in the final stage of the lifting.

Background

Forewind contracted Fred. Olsen United through an engineering, procurement, construction and installation (EPCI) agreement, to design, construct and install two innovative suction-installed bucket foundations and meteorological mast topsides.

The EPCI contract utilised Fred. Olsen related companies including:

- Marine engineering firm SeaRoc, based in Chichester and Dundee, which designed and delivered the meteorological masts;
- Harland and Wolff, responsible for fabricating the foundations in Belfast, and
- Fred. Olsen Windcarrier, whose 132m jack-up vessel Brave Tern installed the foundation on her first job since being completed in 2012. She returned to install the 44 tonne galvanized steel tower of the mast to complete the full process.

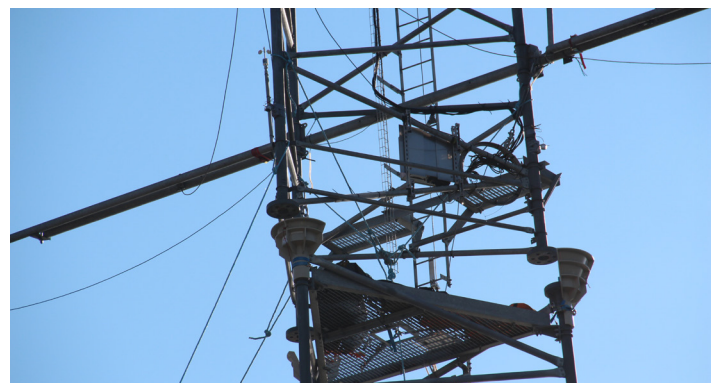
Having successfully installed the eastern foundation – the UK’s first example of a Bucket Foundation installation – attention turned to the meteorological mast tower itself.

The industry standard practice has been that when the lattice tower sections are lifted off the vessel and ready to be fixed in place, riggers will be physically in position to manually help with the final positioning. In this process, riggers are exposed to the potential risk of being crushed by the lattice tower sections. This is a particular concern for the landing of the upper tower section, as the riggers tend to be very constrained in their position at the top of the lower lattice tower section.

Forewind, in cooperation with Fred. Olsen United and its project partners, developed an alternative technique that employed strong plastic guide cones strapped to the tower flanges before any lifting activity. Similar ‘stabbing guides’ are already widely used in industry in different contexts.



Landing the upper tower section with the use of guide cones and video cameras.



The upper tower of the lattice meteorological mast is moved into final position before landing. The installation was complete without any direct human activity. Plastic guide cones were used instead of riggers, who were safely on deck during the placement manoeuvre.

Core value – removing a risk

The lightweight plastic cones used in this “human free” installation technique have a number of benefits as they enable easier handling, do not affect coating on the flanges, and also act as weak-links to avoid structural damage to the mast.

However the key value in this new technique is the fact that by moving the riggers, who previously had to be located near the lattice towers during installation, and instead introducing guide cones with video cameras, the risk of a swinging or falling load causing an accident is eliminated.

Therefore it is both safer than methods used previously, and also a far more efficient means of installation as the cones helped to quickly stabilise the tower in the final stage of the lifting.

The advent of this technique was another example of industry cooperation and the potential safety and efficiency gains to be made through developers and contractors working closely together.

Risk reduction

This process is a practical application of health and safety in design. It uses the framework set out by the Construction Design and Management (CDM) Regulations, which require designers to consider all hazards and risks associated with erecting structures and to design out risk.

Using the As Low As Reasonable Practicable (ALARP) principle, Forewind and its suppliers worked collaboratively to establish a working method to both eliminate the risk of crushing injuries and remove the hazards associated with working at height during the lowering of the upper tower section.

Previous industry best practice was to use riggers to help lower the tower however Forewind revisited “first principles” to see if the inherent risks in this technique could be reduced and a newer, safer method of working developed.

Instead of just using means to adequately reduce the risk to an acceptable level, the “human free” technique provided a viable way to eliminate the risk all together. More specifically, by using plastic guide cones and video cameras, the tower section could be landed without anyone needing to work directly underneath the load.

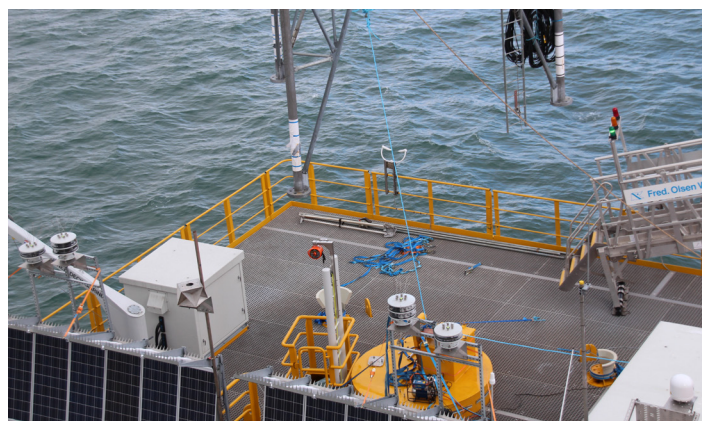
The cones fan outward at the top and help guide the lattice tower legs into position as they are lowered. Manufactured from a lightweight, strong reinforced plastic, the guide cones can be easily mounted and removed via the use of ratchet-straps. Being lightweight, they can easily be raised and lowered by the riggers at the interface between the two lattice tower sections.

The cameras mounted on the legs of the lattice tower section being lifted point towards the guide cones as the tower section is lifted into place. The video feed is displayed on a screen that can be monitored by the lift supervisor throughout.

Once the lattice tower section has been lifted into place above the guide cones, it is then lowered and quickly settles into its final position. Riggers can then ascend the mast to the interface between the tower sections to bolt the sections together and remove and lower the guide cones and cameras. The bolts are then tightened and the load taken off the crane.

Before its actual implementation, practice runs of the technique were carried out in the drydock at the Harland and Wolff plant in Belfast.

The technique, which has proved to be both safer and more efficient, was then successfully used to install Dogger Bank Met Mast East on behalf of Forewind.



The lower section of the mast tower is lowered onto the platform.



Plastic guide cones attached to the flanges.

Wider industry learning

While there were some initial reservations about whether the “human free” technique could be implemented, after a thorough development and testing period, and the successful application on site, the new system has been well received by all involved in the project. The method has been communicated to the owner companies and will be further disseminated to ensure other industry contractors and developers can benefit from Forewind’s learnings.

This method of installation would be suitable for use with for other meteorological mast projects, both offshore and onshore.

This is an example of CDM good practice, that it is possible to eliminate safety risks by re-designing accepted practices to remove potential hazards. It also shows that it is important to challenge industry ‘best practice’ and revisit “first principles” to establish whether further improvements can be made.

Key HSE impacts

With riggers being physically removed from the lattice towers during installation, and through the use of guide cones and video cameras, it eliminates the risk of an accident being caused by a swinging or falling load. The use of guide cones enables the crew to stay on the vessel deck, and away from the lifting hazards.

Therefore it is both safer than methods used previously, and a far more efficient means of installation as the cones helped to quickly stabilise the tower in the final stage of the lifting.