

Forewind and Dogger Bank: An aerial approach to offshore inspections

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.

The Dogger Bank Zone is the largest and furthest from shore of all the UK's proposed wind farm zones. The weather and sea conditions are harsh and so maintenance of the turbines, foundations and infrastructure at the world's largest wind farm development will present a challenge both in terms of health and safety, as well as cost.

Initiative summary

Forewind has introduced the use of a remotely operated aerial vehicle (ROAV) to carry out bolt and structural inspections on its two Dogger Bank meteorological masts.

An ROAV is similar in concept to an underwater remotely operated vehicle (ROV) except that it operates in the air. Just like its underwater counterpart, an ROAV can be used as a tool to access areas of plant or equipment where it is not especially desirable to send a worker due to risk and safety concerns, such as working at height.

The ROAV is essentially a small multi-rotor, electric helicopter controlled remotely from the ground or a service vessel by a two-man crew – a pilot and an inspection engineer. Weighing less than two kilograms, the ROAV is fitted with camera equipment, which is operated by an inspection engineer on a separate control module to allow the pilot to focus purely on flying. The inspection engineer can pan, tilt and zoom the camera to obtain video and still imagery of the structure they are inspecting. Cyberhawk, the industrial inspection specialists, carried out the ROAV work.



The remotely operated aerial vehicle (ROAV) takes off for the meteorological mast inspection..

The high definition images captured by the ROAV identified the precise maintenance requirements for each met mast, meaning that the jobs could be better planned in advance – with appropriate tools and spares brought to site during the maintenance trip. The risk of discovering

additional unplanned maintenance requirements during the main trip and having to return is also significantly reduced, which saves money and reduces wasteful downtime.



The ROAV circling the met mast.

Forewind was able to obtain a comprehensive photographic record of the met masts, making it easier to identify and track any issues.

The use of ROAVs in pre-maintenance inspections of the met masts has the potential to deliver significant savings and efficiencies in wind farm operation and maintenance, and importantly, reduce health and safety risks.

The main health and safety benefit from the ROAV is the fact its use significantly reduces the time anyone has to spend working at height or using rope access – essentially removing workers from potentially risky situations and instead using a drone safely operated from the vessel deck.

Background

Forewind applied experience from the oil and gas industry, and used an ROAV to inspect its two met masts on Dogger Bank in early 2014. The activity would normally require up to six rope access climbers more than two days per mast, however the ROAV was able to undertake the bolt inspection on each mast in less than a day. Far quicker than the time it would have taken if riggers had performed it using the traditional approach, and without the health and safety risks.

In addition to the main bolt inspection job, it was also possible to check a number of other items at the same time. This included undertaking a general structural survey of the lattice tower, the underside of the platform and the boat landing.

The use of the ROAV for these additional inspection tasks meant there was no need to employ rope access, where workers are suspended over water while carrying out their tasks. It also identified wave-related damage to an access platform and fall arrest system, so replacements could be brought on the trip.

Core value: Removing workers from risk situations

By removing the requirement for individuals to work at height, undertake vessel transfers or work in harnesses suspended on ropes over the sea, the use of the ROAV has reduced or eliminated a number of potential risk situations. It is a relatively simple solution to a number of potential health and safety risks that are inherent in traditional inspection methods.



The inspection engineer reviews the met mast from the vessel deck.

The meteorological mast inspection is one example of the use of this application but it has the potential to be used far more widely across the offshore wind energy industry, particularly during the operation and maintenance phase. Turbines and offshore infrastructure could all be inspected using this approach.

Risk reduction

The technique reduced the health and safety risks associated with transferring to the platform from a vessel, or more importantly climbing up the towers to work at height.

While operators still need to sail to the meteorological masts for on-site maintenance, this preliminary inspection technique helped Forewind to plan that visit and assess the type of work that would be needed once they arrived.

It definitely has the potential to be used more widely across the offshore wind industry to make efficiency gains and reduce health and safety risks during operation and maintenance.

Wider industry learning

One of the Forewind owner companies has now introduced the use of ROAVs for its own meteorological inspections. Another is planning to

trial the technology for blade inspections showing that it has wide potential application than meteorological masts but can be used for existing wind farms – turbines and other offshore infrastructure.

In addition, Forewind's main engineering, procurement and construction (EPC) contractor Universal Foundation Norway (UFN) has, since the initial use of the ROAV, carried out two inspection trips to the Forewind meteorological masts. Both times they used the ROAV technology to perform inspection work, which completely eliminated the need for workers to transfer to the mast and perform work at height, but also removed the need for rope access over water.

Sharing the information

The approach was shared widely via a media release to the renewables press and accompanying stories in industry publications. It was published on the Forewind website and newsletter – Dogger Bank News – which is distributed both in hard copy and electronically to more than 5000 individuals and organisations. It also featured in Forewind's Annual Review 2014, which summarised the organisation's activity for the previous 12 months and was sent to more than 500 main stakeholders including statutory bodies, governmental organisations and key decision makers.

It was also the subject of a presentation given by Forewind's HSE Manager, Nachaat Tahmaz who talked about the case study, entitled "Forewind: Innovative inspections – Use of Remotely Operated Aerial Vehicles in Wind Farm Maintenance" at Renewable UK's Global Offshore Wind 2014.

The methodology and outcome of the trip was shared with the four Forewind owners and with key contractors.

Key impacts

This approach to offshore inspection has impacted positively in a number of ways:

- 1. It significantly reduces, or even eliminates, the need to work at height.**
- 2. Likewise it reduces, or eliminates, the need to perform rope access work over water (when workers are suspended in ropes underneath offshore platforms and infrastructure to inspect for such issues as rust or cracks)**
- 3. It minimises the amount of days spent offshore because all the preparatory work has been done by the ROAV. This represents a major cost saving on vessels, personnel and time.**
- 4. The number of offshore personnel who are potentially being put at risk is reduced – because less time is required there is not the need for multiple shifts.**
- 5. It also reduces the number of potentially risky transfers from vessels to the offshore structures.**
- 6. It has the potential to be widely adopted by the offshore wind energy industry for operation and maintenance of not only met masts but also turbines and other offshore infrastructure.**