‘Ships in Bottles & Offshore Wind Turbines’
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Abstract
Offshore wind farms are becoming a common feature around UK coastal waters. At the time of writing, based on current Crown Estate figures, offshore windfarms are providing some 5% of the UK’s annual electricity requirements. This is expected to grow to 10% by 2020. The UK currently has 29 offshore wind farms generating over 5.1 GW of operational capacity with a further 4.5GW under construction. Topside turbines are state-of-the-art engineering mechanisms that efficiently convert wind energy into electricity which is transmitted back to the shore and into the national grid. Turbine apparatus, typically weighing over 300 tons is supported on a monopole structure standing in sea water depths up to 100 feet in coastal and tidal areas.

Objectives

These large, freestanding structures, located in demanding environments provide an ideal opportunity to demonstrate innovative integrity assessment approaches. One key project involved required a fast-track solution for testing the fitness-for-purpose of subsea circumferential butt welds in a monopile following offshore installation. Tidal conditions precluded the use of an external diver or ROV inspection and the solution lay with an internal approach.

While external conditions may be less than benign, the environment within the monopile is calm and controlled and inspection equipment was pioneered to collect high definition, ultrasonic weld flaw information - regardless of flaw orientation (longitudinal or ‘chevron’, horizontal type) - in one pass of the inspection head. The tool was deployed via an inspection class ROV that could manoeuvre within the confines of the six-metre diameter structure.

Methods
Despite detailed technical planning, training and onshore rehearsals, unforeseen challenges did arise. The sediment particles from the seabed within the monopile disturbed by the movement of the ROV thrusters hung suspended in the water and took a period to re-settle, which reduced visibility. Onboard cameras were repositioned and additional scanner cameras coupled with laser tracking lights installed to ensure accurate transducer positioning. The work proceeded and the desired weld data was successfully collected which underpinned the engineering criticality assessment and verified the structure’s fitness-for-purpose.

For engineering stability, monopiles are flooded to match the external sea water depth. Inside the monopile a gas light floor is located some 30 feet above sea level. A one meter diameter access hatch in the gas light floor provides access to circumferential gantry above the water level. Any equipment used below the gas light floor has to fit through this hatch hence the comparison with building a ship in a bottle.

Operating on any new unmanned offshore structure requires specific training and detailed planning. The offshore inspection team has to be completely self-sufficient and able to operate and perform duties independently. This includes power (generator) and all support equipment for the team’s welfare with good radio skills essential to maintaining regular operational status checks.

Conclusions
This project provides a comparison between the oil and gas and offshore renewable industry’s operating procedures. Renewables haven’t simply inherited traditional oil and gas methods, rather taken best practices and tailored to suit. HSE processes are, for example, particularly rigorous and reassuring.

References
1. Work Experience Project (2011) – Matthew Kennedy

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