

Synchronized up-ending

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Demag crawler cranes effortlessly up-end gigantic wind turbine jackets for Sarens

Just a little over 13 km off the Caithness Coast of Scotland, offshore construction of one of the deepest windfarms in the world has reached fever pace. The £2.6 billion Beatrice Offshore Windfarm (Beatrice) project will be capable of generating enough electricity to power approximately 450,000 homes and reduce annual CO2 output by 851,654 tonnes. The Beatrice plan includes 84 Siemens 7MW wind turbines to generate 588MW of electricity each year.

Each massive turbine is constructed with a 154-m-diameter rotor and total turbine height of 198,4 m. Construction crews in this region of the North Sea will be working at sea depths reaching 55 m to anchor each turbine to the seafloor. Serving as the underwater foundation platform, jacket substructures are being constructed by Burntisland, Scotland's, Burntisland Fabrications (BiFab) at heights from 68 to 81 m tall.

The first 26 jacket substructures are currently under construction at BiFab's facility in Methil, Fife. With each turbine anchor weighing of approximately 1.000 tonnes, BiFab searched for a heavy lifting partner to devise an efficient, repeatable and safe plan for transporting the offshore jackets from the fabrication facility, lifting each structure into a vertical position and loading the turbine bases onto the specialized transport vessels for final positioning.

For this phase of construction of the landmark deep-water Beatrice windfarm, a heavy lifting specialist was needed. To handle the heavy lifting, BiFab selected Sarens, of Wolvertem, Belgium, a recognized worldwide leader in heavy lifting and engineered transport. "Our strategy included using self-propelled modular transporters (SPMTs) to move the jacket in a horizontal position approximately 80 m to the up-ending location at the harbor," says Andrew Hunt, operations manager for Sarens.

For the delicate task of lifting the jacket substructures into their vertical position, given the unpredictable weather at BIFAB's Methil facility, Sarens relied on four of its most trusted pieces of crane equipment. "We used our Demag® CC 9800 and CC 8800-1 crawler cranes to carry the main load and smaller cranes, one of them a Demag CC 2800-1 to help finesse the jacket into its vertical position" continues Hunt.

Synchronized Performance

Sarens moved its two heavy lifters into BIFAB's Methil Quayside Facility by vessel. "The CC 9800 arrived first from a project in Rotterdam (the Netherlands) and our CC 2800-1 crane, which had already been mobilized from a project in the United Kingdom, helped to offload and rig the crane," comments Hunt. "Within approximately 10 days, we had the CC 9800 rigged with its Superlift configuration, 96-m main boom, 18-m fixed jib, and 640 tonnes of counterweight. It then took some additional time for testing and commissioning."

Following closely behind the 1.600-metric-ton capacity CC 9800 crane, the Demag CC 8800-1 arrived from a project in Bremerhaven, Germany. The CC 9800 and CC 2800-1 cranes helped to offload and rig this second 1.600-metric-ton class crawler crane with 90 m of main boom, 18-m fixed jib and Superlift configuration with 640 tonnes of counterweight. "We had the CC 8800-1 rigged, tested and commissioned in about 7 days," adds Hunt.

With the crane equipment and 78 axles of SPMTs in place, Sarens was ready to lift the first of 10 jackets planned for installation in 2017. An additional 16 jackets are planned for fabrication and installation spring of 2018. The four SPMT operators transported the 1.022-tonne load 76 m to the quayside up-ending location. "This step took approximately two hours to complete," says Hunt.

As Sarens' lifting crew took over, they attached a custom-engineered spreader beam to the top of the jacket. "Both the CC 8800-1 and CC 9800 were attached to the beam, and the beam was connected to the top of the jacket platform at a single, central lifting position," offers Andrew Hunt. "This allowed the two cranes to evenly share the load."

Working at a 20-m radius, both the CC 9800 and CC 8800-1 respectively began hoisting the load in slow increments toward its final position, slewing slightly during the process. At the same time, the two tail CC 2800-1 cranes attached to the bottom of the jacket's legs began to hoist, slew and track toward the two main lifting cranes. "For this operation, the tail cranes were equipped with 66 m of main boom and 100 tonnes of counterweight and hoisted the jacket legs at a 25-m radius," comments Hunt.

As the offshore jacket transitioned to its vertical position, the load was transferred over to the main CC 8800-1 and CC 9800 cranes. The tail cranes started slewing the jacket into its final vertical position until the full 1.022-tonne load was shared between the main lift cranes. In total, it took four crane operators and six banksmen 1.5 hours to up-end the jacket from its horizontal position. Up-ending the first of many offshore jackets so quickly and efficiently impressed all who were a part of the challenging lift.

"I cannot say enough about the professionalism of the Sarens team and performance of the Demag cranes," offers Hunt. "It is extremely challenging to coordinate lifting operations between the two main lifting cranes and two tail cranes. We chose the Demag cranes because they were the best technical solution for the project due to the capacities and need for precision."

An Extra Boost

For the next series of jacket handling at the harbor, Sarens' Demag CC 8800-1 will be given an extra capacity boost. The 1.600-metric-ton-class crane will be re-rigged with the Demag Boom Booster Kit, which increases crane capacity when working at steep boom configurations. "Our Boom Booster Kit was designed specifically with such applications in mind" says Guntram Jakobs, product marketing manager for Terex Cranes. "It can increase the CC 8800-1 crane's capacity by up to 90%, allowing it to out lift some 3.000-tonne class cranes under certain conditions."

The wedge-shaped Boom Booster's design includes 11-m-long lower and upper adapters that flare out to a 10-m width, nearly three times the standard boom's width, to enhance structural integrity. Up to five, 10-m-long interior boom segments can be added to provide up to 72 m of lift-enhancing boom structure. "We plan on using the full 72 m of the Boom Booster for this project," says Hunt.

Hunt continues by explaining why the Demag Boom Booster Kit is required for the next phase on the project. "Jacket weights will increase to over 1.200 tonnes each, requiring the CC 9800 and CC 8800-1 to have 800 tonnes on each carrier," he says. "On top of reconfiguring the CC 8800-1 with full Boom Booster, we will add Superlift ballast to both cranes to handle the extra load".

Source: Terex Cranes